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14. ABSTRACT
This update report presents the results of work completed to evaluate additional analytical data collected to augment the original fuels weathering study performed for AFCEE. The original report, "light Nonaqueous-Phase Liquid (LNAPL) Weathering at Various Fuel Release Sites" was completed Sep 1999. The existing data set from the original fuels weathering study was augmented with newly-collected data from several additional sites. The expanded data set was used to form a more robust database for estimating fuel LNAPL weathering rates.

Both the original study and this update focus primarily on the weathering or natural depletion of BTEX components from free-phase product.

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FINAL

Light Nonaqueous-Phase Liquid Weathering at Various Fuel Release Sites 2003 Update

Prepared For

U.S. AIR FORCE

Air Force Center for Environmental Excellence
Science and Engineering Division
Brooks City-Base
San Antonio, Texas

August 2003

PARSONS

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September 2nd, 2003

Mr. Jerry Hansen
AFCEE/ERS
3207 Sidney Brooks Road
Brooks City Base, San Antonio, Texas 78235

Subject: Submittal of the Final Report for Light Nonaqueous Phase Liquid Weathering Rates at Various Fuel Release Sites, 2003 Update (AFCEE Contract F41624-00-D-8024, TO24)

Mr. Hansen,

Please find enclosed two copies of the Final Report for Light Nonaqueous Phase Liquid Weathering Rates at Various Fuel Release Sites, 2003 Update. The final report was also submitted to the various site managers of the bases included in the study in electronic form for their use. The final report was prepared by Parsons Engineering Science, Inc. (Parsons) for the Science and Engineering Division of the Air Force Center for Environmental Excellence (AFCEE/ERS). If you have any questions, require additional information, or additional copies of this final report; please contact Dan Griffiths at (303) 764-1940 or Bruce Henry at 303-764-1986.

Sincerely,

PARSONS

For Linda Murray

Linda Murray
Project Manager

cc: Mr. Jack Sullivan – Parsons San Antonio (1 copy)
AFCEE/MSCD (letter only)
HSW/PKVCB (letter only)

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FINAL

LIGHT NONAQUEOUS-PHASE LIQUID WEATHERING AT VARIOUS FUEL RELEASE SITES

2003 UPDATE

August 2003

Prepared for:

Air Force Center for Environmental Excellence

Science and Engineering Division

Brooks City-Base

San Antonio, Texas

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ACRONYMS AND ABBREVIATIONS

%/yr	percent per year
°C	degrees Celsius
AD Little	Arthur D. Little
AFB	Air Force Base
AFCEE/ERS	Air Force Center for Environmental Excellence/Science and Engineering Division
AGE	aerospace ground equipment storage area
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
DFSP	Defense Fuel Supply Point
DoD	Department of Defense
EAL	Evergreen Analytical Laboratory
ft/yr	feet per year
GC/FID	gas chromatography/flame ionization detection
GC/MS	gas chromatography/mass spectrometry
GC/PID	gas chromatography/photoionization detector
GSI	Groundwater Services, Inc.
H	Henry's Law Constant
JP-4	Jet petroleum No. 4
JP-5	Jet petroleum No. 5
JP-8	Jet petroleum No. 8
K_{fw}	fuel/water partitioning coefficient
LNAPL	light, nonaqueous-phase liquid
LTM	long term monitoring
M&E	Metcaff and Eddy
MCAS	Marine Corps Air Station
MCL	maximum contaminant levels
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/mL	milligrams per milliliter
μg/L	micrograms per liter
μg/mL	micrograms per milliliter
MTBE	methyl tert-butyl ether
NRMRL	National Risk Management Research Laboratory
PAH	polynuclear aromatic hydrocarbons
OBG	O'Brien and Gere Laboratories
Parsons	Parsons Engineering Science, Inc.
R^2	coefficient of determination
RNA	remediation by natural attenuation
SVE	soil vapor extraction
TMB	trimethylbenzenes

ACRONYMS AND ABBREVIATIONS (Continued)

TO	task order
US	United States
USACE	United States Army Corps of Engineers
USAF	US Air Force
USEPA	US Environmental Protection Agency
USN	US Navy
UST	underground storage tank
vol%	percent by volume
wt%	percent by weight
yr^{-1}	per year

SECTION 1

INTRODUCTION

This update report presents the results of work completed to evaluate additional analytical data collected to augment the original fuels weathering study performed for the Air Force Center for Environmental Excellence, Science and Engineering Division (AFCEE/ERS) by Parsons Engineering Science, Inc. (Parsons). The original report, completed in September 1999, is entitled *Light Nonaquous-Phase Liquid (LNAPL) Weathering at Various Fuel Release Sites*. The existing data set from the original fuels weathering study was augmented with newly-collected data from the previously sampled sites as well as historic and newly-collected data from several additional sites. The expanded data set was used to form a more robust database for estimating fuel LNAPL weathering rates. This update was prepared by Parsons under AFCEE contract number F41624-00-D-8024, Task Order (TO) No. 0024.

Both the original study and this update focus primarily on the weathering or natural depletion of benzene, toluene, ethylbenzene, and xylenes (BTEX) from free-phase product (i.e., mobile LNAPL) following a fuel release. The BTEX compounds typically are identified as fuel hydrocarbon contaminants of concern because of their solubility and resulting mobility in soil and groundwater, and their relative toxicity (particularly benzene). Of primary interest for the study were jet petroleum no. 4 (JP-4) sites, because JP-4 was the most commonly-used fuel at Air Force installations. However, spill sites with gasoline, JP-5 and JP-8, also were evaluated.

1.1 PROJECT SCOPE AND OBJECTIVES

At many government and commercial sites, large-volume environmental releases of fuel products have contaminated, and continue to contaminate, soil and groundwater systems. Primary sources of large-volume fuel releases include fuel handling and storage activities associated with aboveground storage tanks (ASTs), underground storage tanks (USTs), fuel pump houses, fuel hydrant systems, oil/water separators, and fuel pipelines. Uncontrolled catastrophic or chronic releases from such a source can result in large volumes of fuel entering the subsurface. In the subsurface, the LNAPL often is present both as residual and mobile contamination. Residual LNAPL is defined as the LNAPL that is trapped in the aquifer by the processes of cohesion and capillary pressure, and therefore, will not flow within the aquifer or from the aquifer matrix into a groundwater well under the influence of gravity. Mobile LNAPL is defined as LNAPL that is free to flow in the aquifer and will flow from the aquifer matrix into a well under the influence of gravity.

The purpose of this study is to scientifically determine defensible natural LNAPL weathering rates (i.e., contaminant source-term reduction rates) that can be used during contaminant fate and transport analyses. Currently, little information is available regarding rates of natural weathering of the BTEX components from mobile fuel-related LNAPL. As a result, the rate of reduction of the contaminant source term in groundwater models often is left to professional judgment or guesswork. The use of overly conservative LNAPL weathering rates to evaluate contaminant fate and transport and the suitability of remediation by natural attenuation (RNA) as a remedial alternative can extend the estimated timeframe for long-term monitoring (LTM) and affect the perceived cost-effectiveness and administrative feasibility of implementing RNA. Conversely, overestimation of weathering rates can lead to an overly optimistic forecast of RNA performance. This could result in the application of RNA at a site where some source removal is warranted. The potential result could be further economic and environmental damage, including impact to receptors.

The primary objective of the original fuel weathering study was to document a range of BTEX weathering rates for the mobile LNAPL fraction based on data collected from sites with documented mobile LNAPL plumes with known release dates. In addition, rates of naphthalene and methylnaphthalenes weathering from mobile LNAPL were evaluated. Secondary objectives of this study included an evaluation of the degree of contaminant partitioning of BTEX from mobile LNAPL to groundwater, and comparison of weathering effects on the mobile LNAPL fraction and on residual LNAPL present in capillary fringe soils. The following tasks were completed during the original study to meet these objectives:

- A literature search to assess existing information regarding weathering of LNAPL;
- Selection of eight primary sites where the time of release is generally known and free-phase jet fuel or gasoline remain *in situ*;
- Sampling of soil, groundwater, and free-phase LNAPL at the eight primary sites;
- Evaluation of data obtained from the eight primary sites, as well as data from four secondary sites, to assess contaminant concentrations in site media in relation to such factors as age of the fuel release, fuel type, and site stratigraphy and hydrogeology.

The primary objective of this fuel weathering study update was to collect additional LNAPL analytical data from the original sites having sufficient free product remaining, and to recalculate LNAPL source reduction weathering rates using the expanded data set. A second objective was to add up to four additional sites to the LNAPL analytical database, and to calculate LNAPL source reduction rates for these new sites. Additional secondary objectives of this update study included an expanded evaluation of BTEX contaminant partitioning from LNAPL to groundwater, an evaluation of BTEX weathering rates in groundwater, and evaluation of the Source-DK Model (Groundwater Services, Inc. [GSI], 2002) and alternate methods of determining source weathering rates. The following tasks were completed during the fuel weathering study update:

- A brief literature review was completed to assess any new information that has been published since the completion of the original fuels weathering study in 1999;

- LNAPL and groundwater samples were collected at sites that were included in the original study and that still contained sufficient mobile LNAPL to sample;

- LNAPL and groundwater samples were collected at one additional site for inclusion in the fuels weathering analytical database;

- LNAPL weathering rates and partitioning coefficients were calculated using the expanded LNAPL and groundwater analytical database;

- BTEX weathering rates in groundwater were calculated using new and historic groundwater analytical data obtained at locations for which there were a minimum of two data points; and

- The Source-DK Model was evaluated to determine how LNAPL weathering rates calculated using field data compares to decay rates calculated using this source decay model.

This technical report presents the findings of the original fuels weathering study as well as findings of the update study. This report is inclusive, in that it is designed to replace the original fuels weathering study.

1.2 REPORT ORGANIZATION

This technical report consists of seven sections, including this introduction, and three appendices. Section 2 presents pertinent background information and findings from the literature review. Section 3 presents site selection criteria and a listing of the sites selected for the study. Section 4 summarizes the procedures used for collection and analysis of the site data. Section 5 summarizes the analytical results and presents the results of the LNAPL weathering data analysis. Section 6 presents conclusions and recommendations based on the study results, and Section 7 lists the references used in preparing this document. Appendix A provides a copy of the original work plan and site addenda. Appendix B provides the analytical data for LNAPL, soil, and groundwater samples collected at the study sites. Appendix C provides calculations from the data analysis.

SECTION 2

LITERATURE REVIEW

The purpose of the literature review was to compile and summarize available technical literature on natural weathering of the BTEX fraction of fuel LNAPLs released to the subsurface environment. Specifically, the literature search attempted to answer the following question:

> Is there sufficient published scientific information available regarding *in situ* weathering rates for BTEX in mobile LNAPL to determine source-term reduction or weathering rates for mobile LNAPL?

Parson's experience with the AFCEE natural attenuation demonstration initiative had indicated a lack of scientifically defensible information regarding BTEX weathering rates for mobile LNAPL. As a result of this data gap, weathering rates used to simulate BTEX source-term reduction rates in fate and transport models generally have been based on a combination of professional judgment, guesswork, and consideration of site-specific conditions. Typically, total BTEX depletion rates (i.e., contaminant source-term reduction rates) between 1 and 15 percent per year (%/yr) have been assumed. Examples of site-specific conditions considered in assigning weathering rates include groundwater depth, precipitation, composition of the soil/aquifer matrix, and site location; these factors have been used to determine whether BTEX removal from mobile LNAPL is likely to be hindered or enhanced. For example, a total BTEX depletion rate between 10 and 15 %/yr might be assumed for a warm, high-precipitation, high-soil-permeability, shallow groundwater site in Florida; whereas a total BTEX depletion rate of 1 to 3 %/yr might be assumed for a cool, low-precipitation, low-permeability, deep groundwater site in Montana. In cases where site conditions did not appear to excessively hinder or enhance BTEX depletion in mobile LNAPL, a default value of 5 %/yr often was used. No scientific studies were known to exist that could support the validity of these assumptions. Therefore, a more formal literature search was included as part of this study.

A preliminary review of the literature as summarized in the work plan (Appendix A) indicated that there was not sufficient information regarding BTEX weathering rates in mobile LNAPL, and that field studies of fuel-contaminated sites would be appropriate. Since the time of the initial literature review, additional information regarding weathering processes and rates of fuel weathering has been gathered; however, the general findings of the preliminary literature review are still valid. No new field studies were identified that scientifically evaluate naturally occurring BTEX reductions (weathering) within mobile LNAPL at fuel release sites. However, additional data collected from groundwater at 366 petroleum (mostly gasoline) sites has been evaluated to determine average first-order decay rates for BTEX compounds (Farhat *et al*., 2002). These data are discussed in Section 5.3.2. A discussion of fuels composition and a review of the fuel weathering literature is provided in the following subsections as background information for the fuel weathering study results and conclusions presented in Sections 5 and 6, respectively.

2.1 GASOLINE AND JET FUEL USE AND COMPOSITION

2.1.1 Fuel Use and History

Gasoline, diesel fuel, and jet fuel represent the primary fuel types used at United States (US) military installations for powering vehicles, equipment, and aircraft. Large-volume storage and handling of these petroleum products has resulted in widespread environmental contamination of soil and groundwater. However, BTEX contamination in soil and groundwater at US military installations has resulted primarily from uncontrolled releases of jet fuel.

A variety of jet fuels have been used for powering US military aircraft turbine (jet) engines since the beginning of jet flight in the 1940s. Since the 1950s, JP-4 and JP-5 represent the primary fuels used by the US Air Force (USAF) and US Navy (USN), respectively. More recently, the USAF has converted from JP-4 to JP-8 because of its lower volatility and explosion/fire hazard. In 1979, USAF installations in Great Britain replaced JP-4 with JP-8 (Martel, 1987), and in 1993/1994, USAF installations in the continental US converted to JP-8. Therefore, most JP-8 fuel releases that have contaminated soil and groundwater at USAF installations are no more than 9 years old. While other, less common jet fuels have been used by the US military, their use and storage has been limited, resulting in far less environmental site contamination.

2.1.2 Hydrocarbon Composition of Gasoline and Jet Fuel

Gasoline and jet fuel are refined petroleum products derived from crude oil. Crude oil, a degradation product of organic material (e.g., prehistoric animal and plant matter) is a complex mixture primarily composed of hydrocarbons, which are compounds consisting solely of carbon and hydrogen. Measured by weight, carbon and hydrogen represent at least 95 percent of the elements present in crude oil (Neumann *et al*., 1981). In comparison, hydrocarbon concentrations in refined petroleum products such as gasoline, diesel fuel, and kerosene are even higher than in crude oil, because non-hydrocarbon compounds (which contain sulfur, nitrogen, oxygen, or trace metals) are destroyed or removed during the refining process (Owen and Corey, 1990).

2.1.2.1 Distillation

The hydrocarbon composition of jet fuel and other petroleum products derived from crude oil is largely determined during the refining process known as distillation. Distillation is a process whereby the crude oil is heated/boiled, and fractions of the crude oil are separated based on boiling point. During distillation, the more volatile, shorter-chain, lower-molecular-weight hydrocarbons are initially removed at relatively low boiling points, and the less volatile, longer-chain, heavy-molecular-weight hydrocarbons are subsequently removed at higher boiling temperatures. Distillation utilizes the relationship between boiling point and hydrocarbon molecular weight to separate crude oil into useable fractions, or "cuts," for further refinement into petroleum end products.

Because hydrocarbon molecular weight is dictated by the number of carbon atoms present, it is possible to generally classify these distillation cuts by their predominant carbon-atom ranges (American Society for Testing and Materials [ASTM], 1995):

- Gasoline - C_4 to C_{12} hydrocarbons;
- Kerosene and jet fuels - C_{11} to C_{13} hydrocarbons;
- Diesel fuel and light fuel oils - C_{10} to C_{20} hydrocarbons;
- Heavy fuel oils - C_{19} to C_{25} hydrocarbons; and
- Motor oils and other lubricating oils - C_{20} to C_{45} hydrocarbons.

2.1.2.2 Wide-Cut and Kerosene-Based Jet Fuels

Jet fuels commonly used by the Air Force and Navy can generally be separated into two categories: "wide-cut" fuels and "kerosene-based" fuels (Martel, 1987). JP-4 is created by taking a "wide cut" of the distillate to include both the gasoline and kerosene fractions. JP-4 typically is composed of approximately 50 to 60 percent gasoline range hydrocarbons and 40 to 50 percent kerosene range hydrocarbons (Martel, 1987). This large percentage of gasoline imparts increased volatility to JP-4. On the other hand, JP-5 and JP-8 are kerosene-based fuels that contain relatively less volatile, longer-chain hydrocarbons.

2.1.2.3 Hydrocarbon Structure

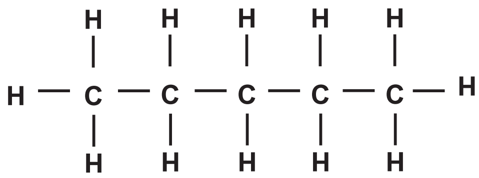
The three most prevalent types of hydrocarbons in crude oil and refined petroleum products, based on their chemical structure, are alkanes, alkenes, and aromatics. Figure 2.1 illustrates the structures of these three types of hydrocarbon compounds.

Alkanes, or paraffins, are hydrocarbon chains characterized by single molecular bonds between the carbon atoms and "saturation" of all remaining bonding sites by hydrogen atoms. For this reason, alkanes also are referred to as saturates. Based on their structure, alkanes can be further separated into n-alkanes (straight-chain alkanes), isoalkanes (branched-chain alkanes), and cycloalkanes (alkane rings) (Figure 2.1). Isoalkanes and cycloalkanes are commonly referred to as isoparaffins and naphthenes, respectively. In general, alkanes are the most abundant hydrocarbons in crude oil and gasoline. Alkanes represent 55 to 75 percent of all hydrocarbons in crude oil (Metcalf & Eddy [M&E], 1993). A compilation of analytical results from 10 gasoline samples indicated that alkanes make up approximately 55 percent by weight (wt%) of the hydrocarbons in gasoline (Nakles *et al*., 1996).

Alkenes, or olefins, are characterized as hydrocarbon chains that are not saturated with hydrogen atoms, and as a result, contain one or more double bonds between carbon atoms (Figure 2.1). While alkenes are typically present at trace levels in crude oil, their

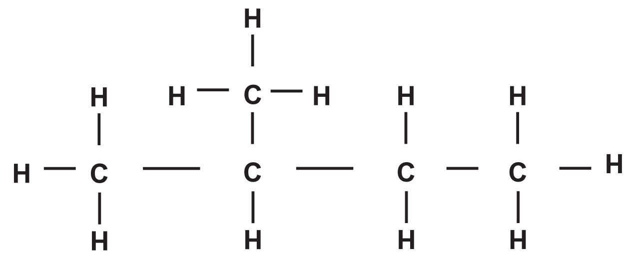
ALKANES

n- Alkane Structure



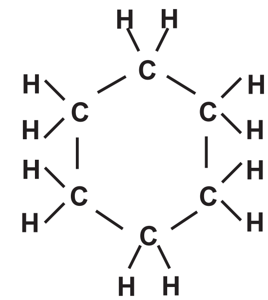
C_5H_{12}
(n-Pentane)

Isoalkane Structure



C_5H_{12}
(2-Methlybutane)

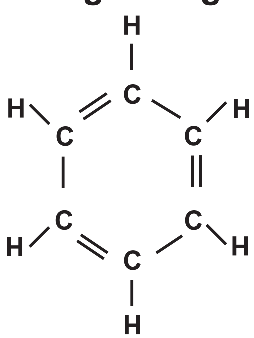
Cycloalkane Structure



C_6H_{12}
(Cyclohexane)

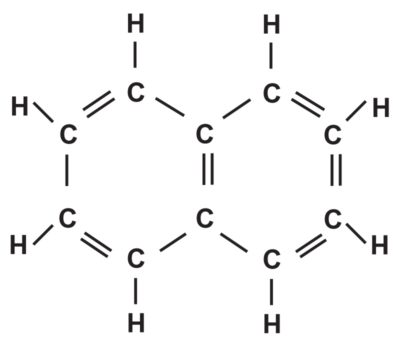
AROMATICS

Single-Ring



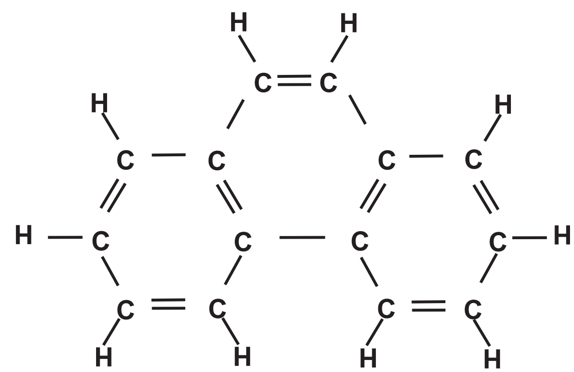
C_6H_6
(Benzene)

Two-Ring



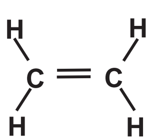
$C_{10}H_8$
(Naphthalene)

Three-Ring



$C_{14}H_{10}$
(Phenanthrene)

ALKENES



C_2H_4
(Ethylene)

FIGURE 2.1

TYPICAL STRUCTURES
OF FUEL HYDROCARBONS

Fuel Weathering Study

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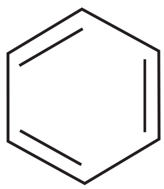
concentration in petroleum products is often increased by the refining process. Nakles *et al*. (1996) reported the concentration of alkenes in gasoline as approximately 11 wt%.

Aromatic hydrocarbons also are unsaturated, and are characterized by their six-carbon ring structure. As illustrated on Figure 2.1, the six-carbon-ring aromatic structure has alternating single and double bonds. The simplest aromatic compound is benzene (C_6H_6), which is composed of a single aromatic ring (monoaromatic). Benzene and its chemical derivatives are common in volatile fuels such as gasoline and JP-4. Other aromatic hydrocarbons more typical of heavier, less volatile fuel types are naphthalene, a two-ring aromatic (diaromatic) and phenanthrene, a three-ring aromatic (Figure 2.1). Three-ring and higher aromatics are often referred to as polynuclear aromatic hydrocarbons (PAHs). Nakles *et al*. (1996) report that aromatics make up approximately 33 wt% of the hydrocarbons in gasoline. However, in jet fuels, the aromatic content is limited to no more than 25 percent by volume (vol%) to improve combustion performance and minimize solvent effects (Martel, 1987).

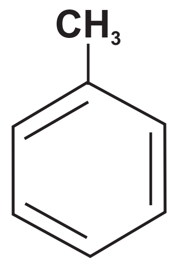
A common feature of petroleum-derived aromatics is the presence of an "alkyl" group in place of a hydrogen atom on the six-carbon ring. Common alkyl groups are the methyl group and the ethyl group. The methyl group is composed of 1 carbon atom and 3 hydrogen atoms (CH_3). The ethyl group is composed of 2 carbon atoms and 5 hydrogen atoms (CH_2CH_3). In the ethyl group, a CH_2 unit is "sandwiched" between the aromatic ring and a terminal CH_3, or methyl group. Toluene, ethylbenzene, and *ortho*-, *meta*-, and *para*-xylenes all are single-ring aromatic compounds where one or two hydrogen atoms have been replaced by one or two of these alkyl groups. As illustrated on Figure 2.2, toluene is simply a benzene ring in which one of the hydrogen atoms has been replaced with a methyl group. In ethylbenzene, the hydrogen atom is replaced by an ethyl group. In the xylene isomers, two hydrogen atoms are replaced by two methyl groups. The prefixes "*ortho*-," "*meta*-," and "*para*-" refer to the position of the methyl groups on the benzene ring.

2.1.2.4 BTEX Composition

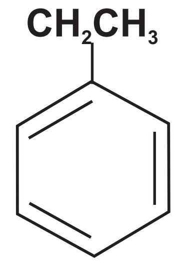
For this study, the weathering of the low-molecular-weight BTEX compounds is of particular concern because of their mobility within the environment and, in the case of benzene, its relatively high toxicity. To adequately characterize the degree or rate of BTEX weathering from mobile LNAPLs, the initial concentration of BTEX compounds within the original fuel is needed. Unfortunately, the exact concentration of BTEX compounds in a gasoline or jet fuel that is released to the environment typically is not known and can only be estimated based on compositional studies of fresh fuels. Cline *et al*. (1991) have noted that the specific composition of gasoline will vary depending on the source of the petroleum, the production method, the end use location, and the season of the year. Similarly, there is considerable variability in jet fuel composition based upon the distillate cuts of gasoline and kerosene from which the jet fuel is blended. Therefore, compositional studies of fresh fuels can provide only a range of BTEX concentrations within fresh fuels.



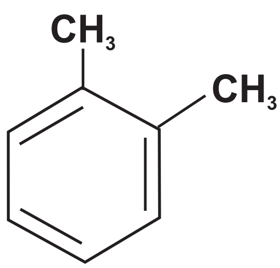
Benzene



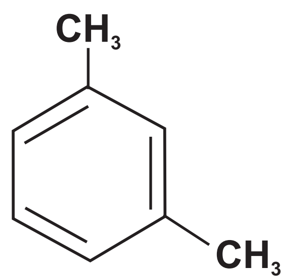
Toluene



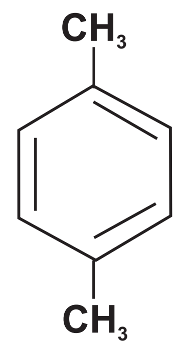
Ethylbenzene



ortho-Xylene
(1,2-Dimethylbenzene)



meta-Xylene
(1,3-Dimethylbenzene)



para-Xylene
(1,4-Dimethylbenzene)

FIGURE 2.2

TYPICAL STRUCTURES OF BTEX COMPOUNDS

Fuel Weathering Study

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Denver, Colorado

Figure 2.3 illustrates the ranges of benzene, toluene, ethylbenzene, total xylenes, and total BTEX concentrations in fresh JP-4, JP-5, and JP-8 jet fuels and fresh gasoline. As is evident from this figure, fresh gasoline has the highest mass fraction (in wt%) of BTEX compounds, followed by JP-4, JP-8, and JP-5 jet fuels.

2.1.2.4.1 Gasoline

For gasoline, there is a large disparity between the minimum and maximum BTEX mass fraction values presented by Potter (1988), Arthur D. Little (AD Little, 1987), and Sigsby *et al.* (1987) (Figure 2.3). Reported maximum concentrations for benzene and toluene are approximately five times the minimum concentrations. The total BTEX maximum concentration is nearly four times that of the reported minimum concentration (38.5 wt% versus 10.4 wt%). Similar disparities were evident in analytical results compiled by the Alberta Research Council (1993) for 124 gasoline samples. For benzene, the minimum and maximum reported concentrations were 0.34 wt% and 5.62 wt%, respectively, and the average benzene concentration was 1.86 wt%. For total BTEX, the minimum and maximum reported concentrations were 4.1 wt% and 45.4 wt%, respectively, and the average total BTEX concentration was 20.7 wt%. The BTEX mass fraction values for gasoline reported by Ghassemi *et al*. (1984) are somewhat lower than these average concentrations (Figure 2.3). Therefore, use of the fresh-product values presented by Ghassemi *et al*. (1984) along with measured *in situ* BTEX concentrations to predict BTEX reductions in gasoline LNAPL would be more conservative than using average concentrations from the other studies cited above.

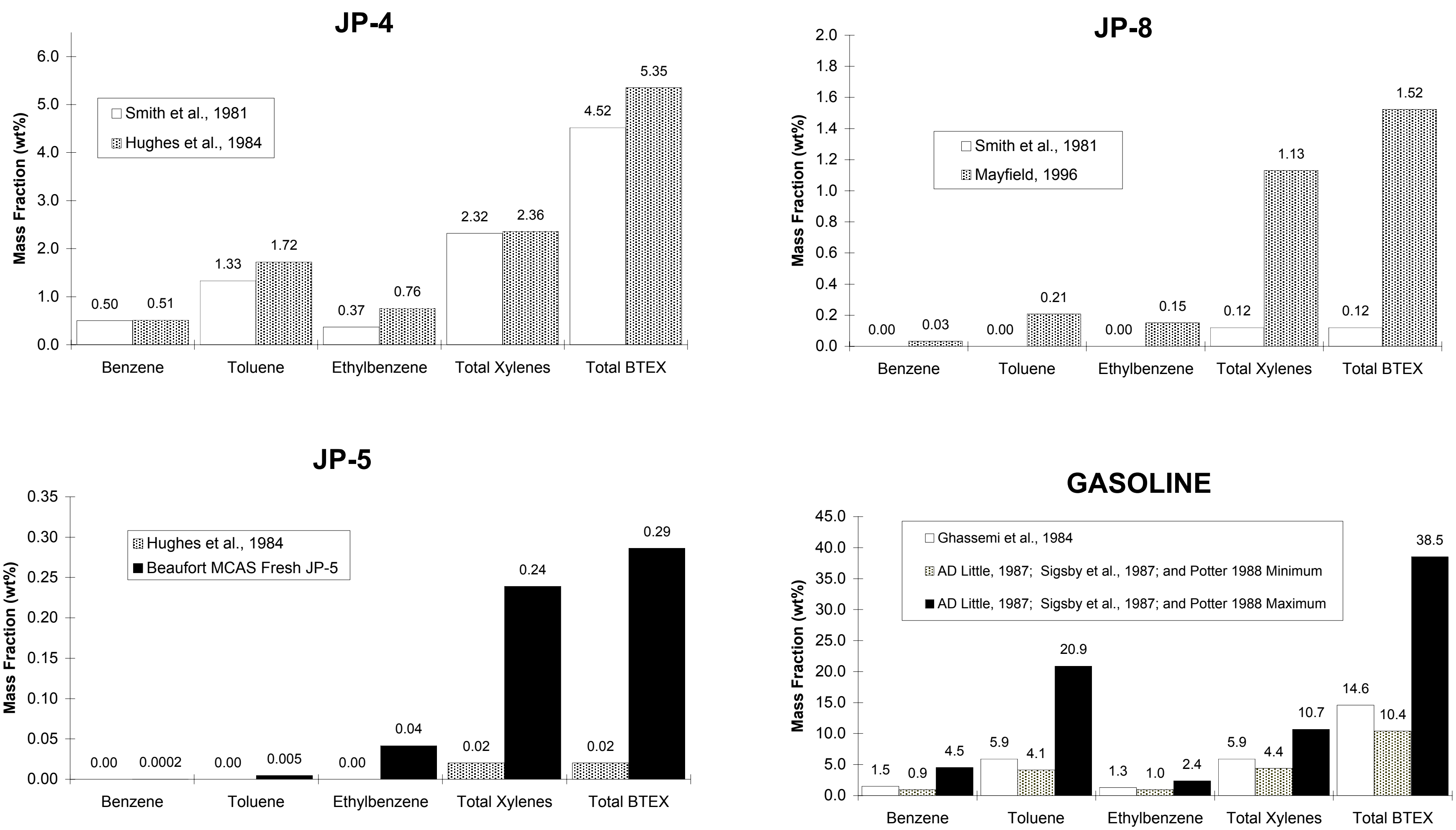
2.1.2.4.2 JP-4

Figure 2.3 presents JP-4 BTEX concentrations reported by Hughes *et al*. (1984) and Smith *et al*. (1981). In the Hughes *et al*. (1984) study, 54 JP-4 samples were analyzed by gas chromatography/flame ionization detection (GC/FID) analysis, and results were reported in milligrams per milliliter (mg/mL). Mass fraction (wt%) results shown on Figure 2.3 were obtained using a maximum density value of 802 mg/mL for JP-4 at 15 degrees Celsius (^{o}C) (Martel, 1987). Mass fraction results presented by Smith *et al*. (1981) were obtained from JP-4 samples analyzed by gas chromatography/mass spectrometry (GC/MS). As shown on Figure 2.3, BTEX mass fraction results presented by Smith *et al*. (1981) are slightly lower than those presented by Hughes *et al*. (1984), and therefore represent more conservative initial values for estimating mass fraction BTEX reductions in JP-4 mobile LNAPL.

2.1.2.4.3 JP-8

BTEX mass fraction results for JP-8 as determined by Smith *et al*. (1981) and Mayfield (1996) also are presented on Figure 2.3. Mass fraction BTEX results presented by Smith *et al*. (1981) were obtained by GC/MS analysis. In the Mayfield (1996) study, 63 JP-8 samples were analyzed by GC/MS and results were presented in milligrams per liter (mg/L). Average mass fraction values shown on Figure 2.3 were obtained using a maximum density value of 840 mg/L for JP-8 at 15 ^{o}C (Martel, 1987). The disparity in BTEX concentrations between these two studies is significant. BTEX concentrations presented by Smith *et al.* (1981) are approximately one-tenth the concentrations presented by Mayfield (1996). The reason for this disparity is not known, but may have resulted

FIGURE 2.3
BTEX CONCENTRATIONS IN FRESH FUELS
FUEL WEATHERING STUDY



s:\es\remed\bioplume/weather\dataeval\FUELBAR.XLS\fuelspsht from changes in JP-8 manufacturing methods or specifications between 1980 and 1996. The Mayfield (1996) study represents a more contemporary and comprehensive review of JP-8 composition, and likely better represents JP-8 jet fuel used in the 1990s. Use of the lower JP-8 BTEX concentrations, as determined by Smith *et al*. (1981), for predicting mass fraction reductions in JP-8 LNAPL while extremely conservative, may not be tenable if BTEX concentrations in site LNAPL exceed these values.

2.1.2.4.4 JP-5

Limited BTEX compositional data were available for JP-5. Results shown on Figure 2.3 are from one fresh JP-5 sample analyzed by Hughes *et al*. (1984) and one fresh JP-5 sample obtained from Beaufort Marine Corps Air Station (MCAS) in Beaufort, South Carolina and analyzed during this study (see Sections 3 and 4). Total BTEX concentrations in both samples were well below 1 wt%. While these data are limited, the relatively insignificant concentrations of BTEX in fresh JP-5 are likely to limit environmental threats from JP-5 releases, especially in comparison to gasoline and JP-4 releases.

2.2 SUBSURFACE LNAPL DISTRIBUTION AND RECOVERY

Characterization of fuel release sites where LNAPL is present in the subsurface is often difficult because of the complex transport parameters and mechanisms associated with LNAPL and separate-phase contamination. Subsurface migration and distribution of LNAPLs, as well as LNAPL persistence and strength as a source of soil and groundwater contamination, is governed by petroleum release factors, soil and aquifer properties, and LNAPL characteristics (Mercer and Cohen, 1990; Pfannkuch, 1984). The primary petroleum release factors influencing migration and distribution are the volume of the release, the release rate, and the area of the release. Influential subsurface properties include, but are not limited to, lithology, soil permeability, pore size distributions, porous media wettability, fluid pressure at and above the water table, and water table fluctuations. Characteristics of the LNAPL itself, such as density and viscosity, also influence subsurface distribution and migration (Newell *et al*., 1995). Once LNAPL is released to the subsurface environment, a defined interface between the LNAPL and soil, air, and water, in the subsurface, typically does not exist (Newell, *et al*., 1995).

2.2.1 LNAPLs in the Unsaturated Zone

In the unsaturated, or vadose, zone, movement of LNAPL initially is controlled by its fluid density and viscosity as it moves downward under the force of gravity (Hunt *et al.*, 1988). Subsurface heterogeneities may cause lateral spreading and trap lenses of LNAPL above layers of lower-permeability soils during downward migration. Interfacial forces (e.g., surface tension between soil-air and soil-water and the LNAPL) and soil capillary forces can cause residual masses of the LNAPL to become trapped in soil pores as ganglia and lenses (Hunt *et al*., 1988; Powers *et al*., 1991; Seagren *et al*., 1993). Because this residual LNAPL can remain trapped in the unsaturated zone for an indefinite length of time, on the order of decades to centuries (Hunt *et al*., 1988), it becomes a long-term source of groundwater contamination via infiltrating precipitation or a rising water table (Abriola and Pinder, 1985; Seagren *et al*., 1993). If the volume of the fuel release is relatively small and the depth to groundwater is great, the entire LNAPL volume may be retained in soil pores as residual LNAPL and not reach the water table.

2.2.2 LNAPLs in the Saturated Zone

If the fuel release is of sufficient volume to reach the water table, the mobile LNAPL fraction will spread laterally and form a floating pool at the capillary fringe above the water table (Pfannkuch, 1984; Voudrias *et al.*, 1994; Voudrias and Moon-Full, 1994). With water table fluctuations caused by seasonal recharge and depression, or by local pumping, an LNAPL smear zone can form over the range of water table fluctuation (McKee *et al.*, 1972; Dietz, 1980; Schwille, 1984; Voudrias *et al.*, 1994;). Like the residual LNAPL in the unsaturated zone, the LNAPL smear zone can be highly variable, with residual LNAPL present as discrete ganglia to fully saturated mobile LNAPL lenses (Hunt *et al.*, 1988). Also, the immiscible nature of LNAPLs can cause discrete LNAPL "blobs" to become trapped in groundwater (Yang *et al.*, 1995) and to be only partially remobilized during changing water table conditions (Hunt *et al.*, 1988).

2.2.3 LNAPL Recovery

Mobile LNAPL, or free product, recovery at fuel release sites often is difficult, expensive, and only marginally effective (Farr *et al.*, 1996). Recovery of free-phase fuel has proven to be difficult because of the complex interaction of hydrogeologic and LNAPL characteristics that tend to retain the mobile LNAPL. Typically, less than 25 to 35 percent of the mobile LNAPL that has spread out on the water table is recoverable (Farr *et al.*, 1996), with significant retention occurring in the capillary fringe during product recovery efforts (Testa and Paczkowski, 1989). Residual LNAPL retained in the unsaturated zone and immobile LNAPL blobs associated with the capillary fringe or submerged below the water table are unrecoverable by conventional means (Testa and Paczkowski, 1989; AFCEE, 1998). Nevertheless, regulatory requirements specifying removal of free product to the "degree practicable" traditionally have been interpreted as LNAPL removal to no more than a sheen (Lundy, 1997). This regulatory expectation, combined with the limited effectiveness of conventional LNAPL recovery methods, have tended to drive up remediation costs as remediation durations are extended with little product recovery or risk reduction.

More recently, a risk-based remediation approach to free product recovery has been proposed (Farr *et al.,* 1996; Lundy, 1997; AFCEE, 1998). Under this approach, site-specific environmental and health risks posed by the mobile LNAPL are evaluated in combination with the feasibility, effectiveness, and cost of free product recovery. At some sites it may be possible to demonstrate that the cost of free product recovery is not justified by a commensurate reduction in site risk. In these cases, it may be more appropriate to model the expected limit of plume migration and to expand the LTM well network to accommodate plume expansion rather than trying to limit expansion through source reduction (AFCEE, 1998).

2.3 LNAPL WEATHERING MECHANISMS

The term "weathering," or attenuation, refers to the combined effects of natural destructive and non-destructive processes to reduce the persistence, mobility, mass, and toxicity of the fuel contaminant in the environment. The majority of information currently available regarding subsurface fuel contamination examines the effects of specific natural attenuation mechanisms such as dissolution, biodegradation, and volatilization as they apply to soil and groundwater contamination. While the literature has focused on these mechanisms as they apply to attenuation of chemicals sorbed to soil and dissolved in groundwater, mobile LNAPL weathering also is a function of these processes.

The primary mechanisms acting to reduce the strength of a LNAPL source are dissolution, volatilization, and biodegradation. These mechanisms are influenced by physical and chemical properties of the chemical compounds in the source product, as well as by physical, chemical, and biological properties of the soil and groundwater system. An illustration of these weathering mechanisms is shown on Figure 2.4.

2.3.1 Dissolution

Dissolution is the dissolving of chemical substances from a residual or mobile NAPL into percolating precipitation water and/or groundwater. At gasoline and jet fuel release sites, dissolution or partitioning of the BTEX compounds from the LNAPL into groundwater represents the most significant source of groundwater contamination and likely the most significant mechanism of BTEX depletion in mobile LNAPLs (Huntley and Beckett, 1997). LNAPL dissolution is governed by the characteristics of the aquifer matrix (including effective porosity and groundwater velocity), physical properties of the LNAPL (e.g., surface area of the LNAPL in contact with groundwater), and characteristics of the specific LNAPL contaminant (e.g., effective water solubility) (AFCEE 1995).

2.3.1.1 Effective Water Solubility of BTEX

Solubility of a substance in water is defined as the mass of the substance that will dissolve in a unit volume of water (typically expressed in mg/L). According to Montgomery (1996), the water solubility of a compound is arguably the most important factor in determining the fate and transport of the compound in the subsurface. The aromatic compounds are among the most mobile of dissolved fuel contaminants at gasoline and jet fuel release sites because of their relatively high water solubilities. Single-ring BTEX compounds are significantly more water soluble than the two-ring naphthalenes, as shown in Table 2.1. Pure-phase water solubilities for the BTEX compounds range between 157 and 1,750 mg/L. Based on these values, benzene is the most water-soluble of the BTEX compounds, followed by toluene, ethylbenzene, and xylenes. In various soil column water-flushing experiments (Borden and Kao 1992; Rixey *et al*., 1992; Voudrias *et al*., 1994), benzene, toluene, ethylbenzene and xylene were flushed from soil columns in order of decreasing solubility. With increased compound solubility, there is increased dissolution flux, indicating compound depletion or weathering in a fuel LNAPL will be more rapid for the more water-soluble compounds like benzene.

The dissolution flux of compounds in fuel LNAPLs also is influenced by the compound's concentration in the LNAPL. In fresh JP-4 jet fuel, benzene comprises approximately 0.50 wt% of the fuel, and in gasoline, benzene typically constitutes no

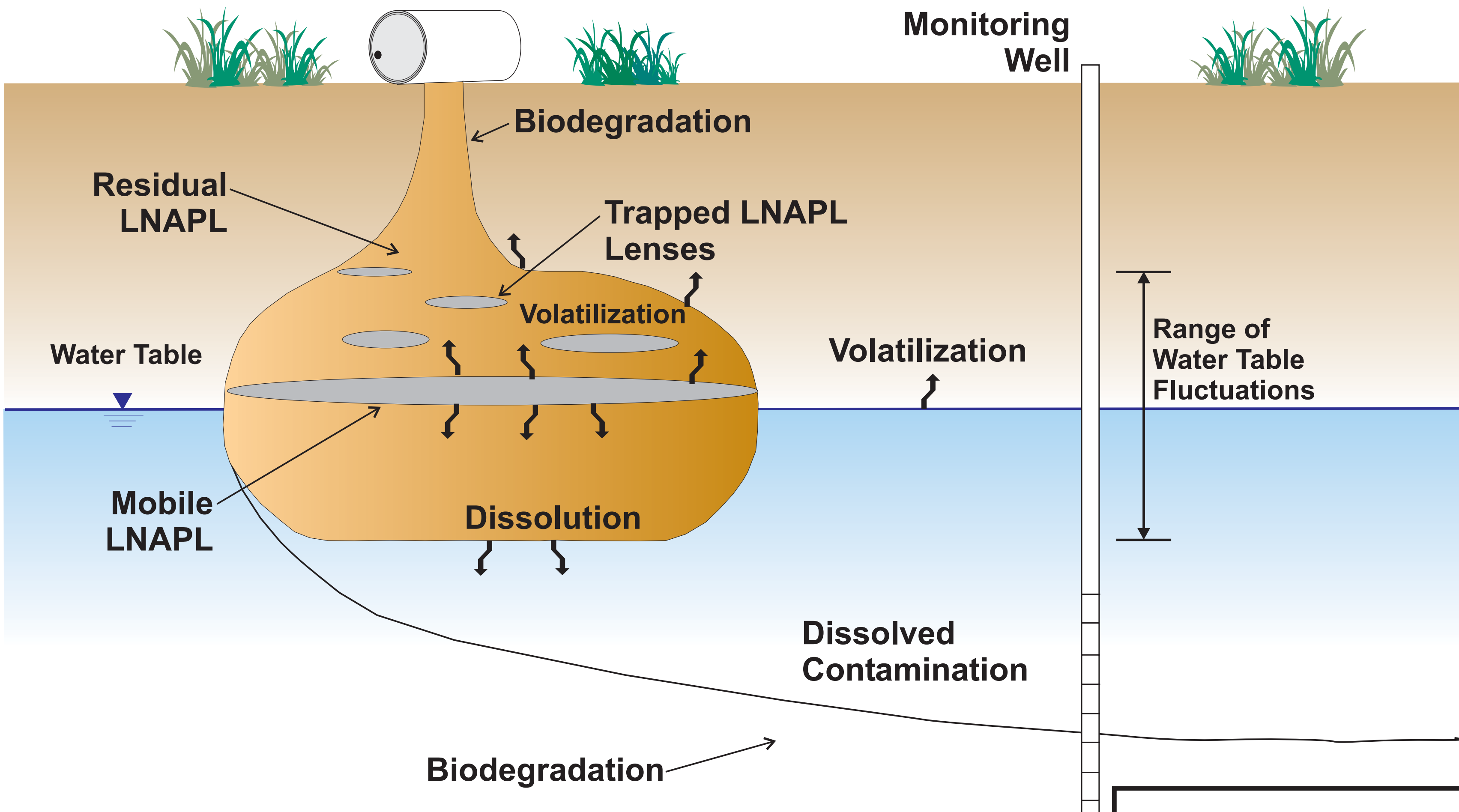


FIGURE 2.4

MECHANISMS OF LNAPL WEATHERING

Fuel Weathering Study

PARSONS

Denver, Colorado

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TABLE 2.1
DISSOLVED CONCENTRATIONS OF AROMATIC FUEL HYDROCARBONS
FUEL WEATHERING STUDY

Compound	Pure-Phase Water Solubility[a] (mg/L)[b]	Concentrations in Water in Contact with Fuel[c] ("effective solubilities") JP-4[d] (mg/L)	Gasoline[e] (mg/L)	MCL[f] (mg/L)
Benzene	1,750	9.82	58.7	0.005
Toluene	524	8.49	33.4	1.0
Ethylbenzene	187	0.67	4.3	0.7
o-Xylene	167	1.21	6.9	NA[g]
m-Xylene	157	2.01	11.0	NA
p-Xylene	180	0.41	4.4	NA
Xylenes	168	3.63	22.3	10
Trimethylbenzenes	97.7[h]	0.87	1.1[i]	NA
Naphthalene	22	0.39	---[j]	0.02[k]
Methylnaphthalenes	25.4[l]	0.24	---	NA

[a] Solubilities at 25°C (Montgomery, 1996).
[b] mg/L = milligrams per liter.
[c] Fuel to water ratio 1:10.
[d] Smith et al., 1981.
[e] American Petroleum Institute, 1985.
[f] MCL = maximum contaminant level (USEPA, 2002).
[g] NA = not applicable.
[h] Solubility for 1,3,5-trimethylbenzene.
[i] Value for 1,2,4-trimethylbenzene.
[j] --- = not available.
[k] Health advisory value for 70-kilogram adult, lifetime exposure.
[l] Value for 2-methylnaphthalene.

more than 4.5 wt% of the fuel (Figure 2.3). Similarly, toluene, ethylbenzene, and xylenes typically are present in gasoline and jet fuels at concentrations significantly less than 10 wt%. Therefore, the dissolution flux of these compounds is significantly less than if they were present in pure phase. As shown in Table 2.1, the actual concentrations of aromatic compounds in water resulting from fuel/water contact are 1 to 2 orders of magnitude less than their respective pure-phase water solubilities. The BTEX compounds are more soluble in fuel than in water, and tend to remain in the fuel. There have been several studies completed in the recent past to determine dissolution rates of fuel components from mobile and residual LNAPLs (e.g., Borden and Kao, 1992; Geller and Hunt, 1993; Rixey, 1996; Durrant et al., 1999; and Garg and Rixey, 1999).

This decrease in dissolution flux resulting from an equilibrium relationship between the aqueous phase and the multicomponent LNAPL has been described by Raoult's Law. Raoult's Law is based on a thermodynamic theory of multicomponent solutions and is typically valid for compounds that are present in relatively low concentrations within the solution (M&E, 1993). Using Raoult's Law, the effective water solubility of a compound (C_i) can be predicted by the product of the water solubility of the pure compound (S_i) and the mole fraction of the compound in the LNAPL (X_i):

$$C_i = X_i S_i \qquad \text{eq. 2.1}$$

In order to use Raoult's Law to estimate effective solubilities, the mole fraction or molecular percent of a compound in an LNAPL or a fresh fuel must be known. However, analytical results for fuel and LNAPL components are typically reported in wt% or vol%, not molecular percent. Using this equation, and estimates of molecular percent for BTEX in gasoline, semiquantitative estimates of effective water solubility have been determined for gasoline (M&E, 1993). However, a 20 to 30 percent disparity was apparent between predicted values and measured water concentrations resulting from gasoline contact (Table 2.1). This disparity is thought to have resulted from inherent uncertainties with the predictions of mole fraction in multicomponent fuels (M&E, 1993).

Despite the difficulty with using Raoult's Law directly, it is useful in illustrating the relationship between compound concentration and compound solubility in evaluating effective solubility at fuel-contaminated sites. As shown in Table 2.1, the pure-phase water solubility of toluene is less than one-third the pure-phase water solubility of benzene, yet the effective solubility of toluene when water is in contact with JP-4 or gasoline is much closer to the effective water solubility of benzene. This similarly results from the higher concentration or mole fraction of toluene in the fuel compared to that of benzene (Figure 2.3). Based on this relationship and the effective solubility values presented in Table 2.1, it appears that ethylbenzene and xylenes are not sufficiently present in JP-4, or sufficiently soluble in water, to consistently exceed regulatory maximum contaminant levels (MCLs) at JP-4 contaminated sites. At sites contaminated by lower-BTEX-content fuels (i.e., JP-5 or JP-8), there is even less dissolution flux of BTEX compounds into site groundwater.

2.3.1.2 Fuel/Water Partitioning Coefficients

Fuel/water partitioning coefficients offer another method for evaluating fuel contaminant dissolution from fuel LNAPLs into water. The fuel/water partitioning coefficient (K_{fw}) is a dimensionless constant defined as the ratio of a compound in the fuel (C_f) to the compound's equilibrium concentration in water in contact with the fuel (C_w):

$$K_{fw} = C_f/C_w \qquad \text{eq. 2.2}$$

Fuel/water partitioning coefficients demonstrate the relationship between water solubility of a compound and abundance of the compound in a fuel. Table 2.2 provides K_{fw} values for constituents of JP-4 and gasoline. As shown, K_{fw} values for BTEX compounds in JP-4 are significantly higher than gasoline values. Relative to gasoline, a larger portion of the BTEX compounds have a tendency to stay in JP-4, resulting in lower equilibrium concentrations in water and higher K_{fw} values.

2.3.1.3 Equilibrium versus Nonequilibrium

Significant debate appears in the literature regarding the applicability of equilibrium conditions when assessing dissolution (Hayden *et al.*, 1992; Seagren *et al.*, 1993; Voudrias *et al.*, 1994; and Yang *et al.*, 1995). Use of Raoult's Law and K_{fw} values to assess contaminant dissolution assumes that equilibrium conditions exist. Often equilibrium is assumed in order to simplify dissolution calculations in subsurface flow models (Seagren *et al*., 1993). For example, once the concentration of a contaminant is known in one phase, equilibrium partitioning is used to calculate the concentration in the other phase at the same location. However, serious errors in prediction of contaminant reduction have occurred when equilibrium assumptions are used in groundwater modeling (Powers *et al.,* 1991). As noted by Bruce *et al*. (1991), dissolved concentrations of the BTEX compounds rarely exceed 20 percent of the calculated equilibrium concentration, unless LNAPL is present as a sheen or colloids. One hypothesis suggests that the lack of equilibrium concentrations occurs from less thorough mixing of the fuel (LNAPL) and water in the field as compared to the laboratory (Bruce, 1993). Groundwater sampling often is performed over several feet of saturated soil, and only the upper few inches of the soil column is in contact with LNAPL. Significant dilution of dissolved hydrocarbons will result in concentrations far lower than theoretical equilibrium values.

As discussed by Seagren *et al*. (1993), if equilibrium conditions exist in the field, the dissolution rate becomes a function of advection (groundwater transport of the contaminant away from the source area) and/or biodegradation. Under this scenario, the dissolution rate is enhanced by contaminant removal from the interphase (LNAPL and aqueous) boundary, thereby increasing the dissolution flux. However, if nonequilibrium conditions exist (e.g., the groundwater concentration of benzene is significantly less than its effective solubility [Table 2.1]), the dissolution rate cannot be enhanced by advection or biodegradation that further reduces the aqueous concentration.

The equilibrium assumption as it applies to LNAPL and groundwater contaminant concentrations has yet to be adequately demonstrated (Powers *et al.*, 1991). Also, while generalizations can be made, no quantitative criteria exist for determining when equilibrium or nonequilibrium conditions exist (Seagren *et al*., 1993). Because it has been argued that the rate of dissolution is a significant limiting factor in remediation of residual LNAPL (Yang *et al.,* 1995), it can also be presumed that dissolution is rate-limiting (i.e., a predominant mechanism) for mobile LNAPL weathering.

TABLE 2.2
FUEL/WATER PARTITIONING COEFFICIENTS FOR BTEX AND TMBs
FUEL WEATHERING STUDY

Compound	Fuel/Water Partitioning Coefficient (K_{fw})		
	JP-4 Jet Fuel[a/]	Gasoline[b/]	Gasoline[c/]
Benzene	2,455	231	350
Toluene	2,754	895	1,250
Ethylbenzene	4,786	3,411	4,500
o-Xylene	7,079	3,162	3,630
m-Xylene	3,715	3,539	4,350
p-Xylene	7,586	2,961	4,350
1,2,3-Trimethylbenzene	NA[d/]	NA	13,800
1,2,4-Trimethylbenzene	8,913	12,270	NA
1,3,5-Trimethylbenzene	NA	6,493	NA

Source: AFCEE, 1995.

[a/] Smith et al., 1981.

[b/] Bruce et al., 1991.

[c/] Cline et al., 1991.

[d/] NA = not analyzed.

2.3.2 Volatilization

Volatilization, or evaporation, is the loss of a compound from a liquid or solid state to a vapor state. For surface spills, important factors affecting volatilization include temperature, vapor pressure of the constituents, and wind speed. For subsurface releases, temperature and vapor pressure are important, but volatilization requires diffusion through a porous medium; therefore, soil moisture and soil porosity also are important (LaGrega *et al*., 1994). Subsurface rates of volatilization are directly proportional to soil porosity, pore size distribution, and temperature, but inversely proportional to volumetric moisture content (Hillel, 1980).

Relative volatility of compounds at equilibrium conditions can be compared by an air/water partitioning coefficient known as Henry's Law Constant (H). Henry's Law states that under equilibrium conditions, the partial pressure of a gas (i.e., volatile chemical) (P_g) above a liquid is proportional to the concentration of the chemical in the liquid (C_L):

$$P_g = HC_L \qquad \text{eq. 2.3}$$

Henry's Law Constant values for BTEX, trimethylbenzenes (TMBs), and naphthalenes are listed in Table 2.3. As a general rule of thumb, compounds with Henry's Law Constants greater than 10^{-3} are considered very volatile (M&E, 1993). As shown in Table 2.3, the BTEX compounds and TMBs are more volatile than naphthalene and 2-methylnaphthalene. Generally speaking, compound volatility decreases with increasing carbon atoms. On a unit-carbon basis, the alkanes are more volatile than the aromatics (Nakles *et al*., 1996).

As with dissolution, contaminant volatilization from a LNAPL is influenced by the concentration of the contaminant in the LNAPL. In other words, a Raoult's Law expression similar to that discussed in Section 2.3.1.1 can be applied.

Enhanced volatilization using soil vapor extraction (SVE) techniques is commonly used for vadose zone cleanup at fuel-contaminated sites; however, no field studies were identified that evaluated "equilibrium" volatilization at sites having subsurface free-phase product. Volatilization is expected to be a significant weathering mechanism for petroleum products such as gasoline, JP-4, and JP-8. From a study on the fate of JP-8 in quiescent flask systems containing water and water/sediment mixtures, evaporation or volatilization from water was the major removal mechanism for low-molecular-weight, volatile hydrocarbons (Dean-Ross *et al.*, 1992). In the same study, it was determined that the presence of sediment can sequester jet fuel and render it less susceptible to volatilization. Intuitively, greater contact between soil gas and residual LNAPL would result in greater mass loss rates due to volatilization than would be expected in soils saturated with mobile LNAPL.

2.3.3 Biodegradation

2.3.3.1 Residual LNAPL and Groundwater

Most of the literature pertaining to *in situ* biodegradation refers to residual LNAPL contaminants in soil and contaminants dissolved in groundwater. As mentioned in

TABLE 2.3
HENRY'S LAW CONSTANTS FOR BTEX, TMBs, AND NAPHTHALENES
FUEL WEATHERING STUDY

Compound	Henry's Law Constant [a] (atm-m^3/mol) [b]
Benzene	5.28E-03
Toluene	6.42E-03
Ethylbenzene	7.88E-03
o-Xylene	4.87E-03
m-Xylene	7.44E-03
p-Xylene	7.44E-03
1,2,3-Trimethylbenzene	3.18E-03
1,2,4-Trimethylbenzene	5.70E-03
1,3,5-Trimethylbenzene	6.73E-03
Naphthalene	7.34E-04
2-Methylnaphthalene	3.18E-04

Source: Montgomery, 1996.

[a/] Henry's Law Constant values at 25°C.

[b/] atm-m^3/mol = atmospheres - cubic meters per mole

Section 2.3.1.3, dissolution appears to be a rate-limiting factor in weathering, especially as it relates to biodegradation. If equilibrium conditions exist, biodegradation of dissolved petroleum contaminants will reduce aqueous contaminant concentrations, thereby enhancing dissolution rates by increasing mass transfer of soluble compounds from residual LNAPL into groundwater (Seagren *et al.*, 1993; Yang *et al.*, 1995). As a result of this dissolution limitation, mass loss rates of dissolved contaminants from biodegradation appear initially to be between zero and first-order (Song *et al.*, 1990), and to decrease with time (Barker *et al.*, 1987).

The kinetics of biodegradation are complicated by the fact that biodegradation is compound-specific and is significantly affected by the geochemistry of the subsurface environment. Dean-Ross (1993) examined the fate of JP-4 jet fuel in subsurface soils and discovered that, for the less volatile, higher-molecular-weight jet fuel components, biodegradation represented a significant mechanism for reducing soil contamination. Song *et al.* (1990) concluded that saturated compounds such as hexane generally are more easily biodegraded than the corresponding aromatic compounds. In a study by Barker *et al.* (1987), mass loss rates for aromatics in groundwater due to biodegradation were greatest for xylenes, followed by toluene, and benzene. Other factors playing an important role in contaminant biodegradation include availability of nutrients, oxygen, and other electron acceptors, and the interfacial area available for mass transfer to aqueous or gaseous phases (Yang *et al.*, 1995). For residual LNAPLs, the size of the LNAPL globules impacts biodegradation rates, with smaller globules resulting in greater interfacial area for mass transfer, and faster biodegradation rates (Yang *et al.*, 1995).

2.3.3.2 Mobile LNAPLs

No studies were identified that addressed intrinsic biodegradation of LNAPL pools. In addition, practical bioremediation of free-phase product has not been demonstrated (Newell *et al*., 1995), most likely as a result of the following:

- Mobile LNAPLs represent a hostile environment for the survival of most soil microbes; and
- Requirements for microbial proliferation (e.g., nutrients, terminal electron acceptors, pH, moisture, osmotic potential) may be impossible to deliver or maintain in the LNAPL pool (Huling and Weaver, 1991).

Consequently, effective bioremediation and tangible intrinsic biodegradation is likely to be limited to the periphery of the mobile LNAPL zone (i.e., residual LNAPL and aqueous phases).

2.4 OTHER FACTORS INFLUENCING LNAPL WEATHERING

In addition to the LNAPL weathering mechanisms discussed above, hydrocarbon layer thickness, groundwater velocity, soil/aquifer material, and distance from the source area are factors expected to impact BTEX depletion within mobile and residual LNAPLs.

2.4.1 Hydrocarbon Layer Thickness

The hydrocarbon layer thickness at the interface of the unsaturated and saturated zones is presumed to influence BTEX dissolution from the LNAPL (Huntley and Beckett, 1997). Dissolution modeling of a 10-centimeter-thick LNAPL pool in fine sand indicated that the effective solubility of benzene could be reduced to approximately 0.001 mg/L in less than a year. However, modeling results for a 50-centimeter-thick pool indicated it would take approximately 70 years to reach the same effective solubility (Huntley and Beckett, 1997). The larger the LNAPL pool thickness, the more slowly benzene is removed from the LNAPL pool.

It is important to note that LNAPL thickness measurements from groundwater monitoring wells are not necessarily indicative of LNAPL thicknesses in the formation (Blake and Hall, 1984; Hall *et al*., 1984; Hughes *et al*., 1988; Testa and Paczkowski, 1989; Farr *et al*., 1990; Mercer and Cohen, 1990; Huntley *et al*., 1994). Mercer and Cohen (1990) suggest that the measured LNAPL thickness in wells is typically 2 to 10 times greater than the LNAPL thickness in the formation. In addition, depiction of mobile LNAPL as a distinct layer present above the water capillary fringe has been challenged (Farr *et al*., 1990). It has been suggested that hydrocarbon-saturated soil layers do not exist at sites with measurable LNAPL; rather, LNAPL and water coexist in soil pores at residual LNAPL saturations ranging up to 40 to 50 percent (Huntley *et al*., 1994). Nevertheless, the thickness of LNAPL within a soil column is expected to influence LNAPL weathering rates.

2.4.2 Groundwater Velocity

If equilibrium conditions exist between the LNAPL and the aqueous phase (Section 2.3.1.3), contaminant dissolution and depletion from the LNAPL source is enhanced with advection or groundwater flow. In soil column experiments performed by Miller *et al*. (1990), the rate of mass transfer between a toluene NAPL and the aqueous phase was found to be directly related to the aqueous-phase velocity. In addition, equilibrium conditions between the two fluid phases were rapidly achieved over a wide range of test conditions. Considering these findings, it is assumed that sites with higher groundwater velocities may exhibit more-rapid BTEX depletion of mobile LNAPLs in contact with the water table.

2.4.3 Soil/Aquifer Material

The type of soil/aquifer material at a fuel release site is expected to influence LNAPL weathering primarily as a result of fluid distribution and migration. Wettability, or the tendency for one fluid to spread on or preferentially coat a solid surface in the presence of another fluid with which it is immiscible, is impacted by the presence of organic matter, mineralogy, and saturation history of the porous medium (Mercer and Cohen, 1990). Capillary pressure also impacts the configuration and magnitude of trapped residual LNAPL and is a function of soil pore size (Newell *et al*., 1995). LNAPLs have been observed to preferentially migrate through sands and gravels rather than silts and clays (Newell *et al*., 1995).

2.4.4 Distance from Source Area

It is presumed that LNAPL weathering is impacted by the distance from the original fuel release location. Because of the effects of source area sequestration, increased surface area, and decreased contaminant mass, it is presumed that peripheral LNAPL weathers at a faster rate than core area LNAPL. It is unlikely that LNAPL weathering occurs at a uniform rate across the area of impact (Landon and Hult, 1991).

2.5 PETROLEUM HYDROCARBON WEATHERING STUDIES

Few weathering studies were identified that evaluated BTEX depletion from gasoline and/or jet fuel LNAPL with the intent of refining contaminant source term reductions for fate and transport modeling. A study was published in 2001 (Peargin, 2001) that provided a summary and analysis of smear zone LNAPL depletion rates of methyl tert-butyl ether (MTBE), benzene, and xylene from 23 gasoline UST sites. 15 of the 23 sites investigated in this study had not undergone significant remediation while the remaining eight sites had been remediated. Fuel component concentrations in groundwater were collected over time from within the source area at each site and first order decay function was fit to the data sets to calculate initial concentrations and depletion rates. The results of this study indicate that MTBE, benzene, and xylene concentration trends at the 15 non-remediated sites show very low or near zero reduction (Peargin, 2001). Alternatively, the results from the 8 remediated sites indicate that MTBE, benzene, and xylene concentration trends show significant concentration reduction over time (Peargin, 2001). Both data sets indicate that there was no significant difference between the individual compound concentration trends (Peargin, 2001). Thus, the individual compounds weathered at approximately the same rates despite the dissimilarity of the compound specific solubilities and diffusion coefficients.

A second more recently published study (Farhat, *et al*. 2002) provides a summary of source decay rates for BTEX compounds based on groundwater data collected from 359 petroleum-contaminated sites. Although the study did not differentiate between sites with LNAPL and without LNAPL, the average benzene decay rate associated with source area wells is comparable to LNAPL decay rates calculated in this study. Additional discussion of these data and their use in the Source-DK model is provided in Section 5.3.2. A second recently published study (Based on a review of the literature, hydrocarbon weathering studies have primarily focused on weathering of crude oil and heavier refined petroleum products such as fuel oils and diesel fuel (Zurcher and Thuer, 1978; Fried, 1979; Law, 1980; Gundlach *et al.,* 1983; Baedecker *et al*., 1987; Eganhouse *et al.,* 1988; Baedecker and Cozzarelli, 1991; Landon and Hult, 1991; Baedecker *et al*., 1993; Christensen and Larsen, 1993; Douglas *et al*., 1994; Vandermeulen *et al.,* 1994; Douglas *et al*., 1996; Nakles *et al*., 1996). Typically, these investigations have focused on the high-molecular-weight, low-solubility fractions in assessing changes in chemical composition. Many of these studies have utilized hydrocarbon ratios and internal biomarkers to evaluate relative degrees of weathering, to estimate spill age, and for source identification (Christensen and Larsen, 1993; Douglas *et al.,* 1994; Douglas *et al*., 1996; Kaplan *et al*., 1996.). A brief summary of the more pertinent findings from the literature search is presented below.

2.5.1 BTEX Decay in Source Area Groundwater

A review of data from 359 petroleum (predominantly gasoline) contaminated sites was used to estimate average decay rates for BTEX compounds dissolved in source area groundwater (Farhat, *et al*. 2002). Average first-order decay constants of 0.22 per year (yr^{-1}), 0.41 yr^{-1} , 0.18 yr^{-1} , 0.25 yr^{-1}, were calculated for benzene, toluene, ethylbenzene, and xylenes, respectively. These rates were calculated using historical data from source area wells with the highest BTEX concentrations. When data from the 180 most contaminated sites was evaluated, the average first-order decay rate for benzene decreased from 0.22 yr^{-1} to 0.16 yr^{-1}. Benzene concentration changes at these 180 sites were more likely to be related to LNAPL dissolution rates.

2.5.2 Bemidji Oil Release Site

In 1979, a crude oil pipeline near Bemidji, Minnesota ruptured and released approximately 450,000 gallons of crude oil into a glacial outwash aquifer. In 1982, the site was selected for a long-term interdisciplinary study by the US Geological Survey. A study performed by Landon and Hult (1991) represents the investigation identified during the literature search that had objectives most similar to those of this fuel weathering study.

The purpose of the Landon and Hult study was to evaluate oil loss rates at a spill site in order to refine contaminant source-term reduction estimates for fate and transport models. Oil samples were collected from various locations within mobile LNAPL pools over a 10-year period to establish oil loss rates. Rather than chemical composition, changes in oil specific gravity and kinematic viscosity were used to calculate oil-mass loss rates. Based on sample results, annual oil-mass loss ranged from 0.1 to 1.25 percent, and total cumulative oil losses after approximately 10 years of weathering were reported to be as much as 11 percent. Important conclusions from this investigation included:

- Oil-mass loss rates were found to vary spatially (i.e., to depend upon location within the oil pool);
- Oil-mass loss rates were found to vary temporally (i.e., to change based on relative age of the release);
- Volatilization of low-molecular-weight compounds was suspected to be the primary weathering mechanism.

Weathering rates for individual chemicals were not determined as part of the Landon and Hult (1991) study. However, depletion rates for BTEX compounds in refined petroleum products such as JP-4 and gasoline are expected to be greater than the total oil-mass loss rates observed in mobile LNAPL at the Bemidji site.

2.5.3 Internal Biomarkers and Hydrocarbon Ratios

At oil release sites, the extent of oil or analyte depletion within soils or sediment has been estimated utilizing an internal biomarker or standard. For crude oil, the saturated pentacyclic (5-ring) triterpane known as hopane has been used because of its resistance to degradation (Douglas *et al*., 1994 and 1996). As biodegradation proceeds, the relative concentration of hopane remaining in the oil increases because of the removal of other more easily degraded compounds. As proposed by Douglas *et al*. (1994), the percent of oil depletion can be estimated by comparing the concentration of hopane in the weathered oil (H_1) with the concentration in the initial source oil (H_0) using the following equation:

$$\% \text{ oil depletion} = [1- (H0 / H_1)] \times 100 \qquad \text{eq. 2.4}$$

In addition, the amount of depletion of any one analyte within the oil can be determined using these hopane values in combination with the analyte concentration in the degraded oil (C_1) and in the source oil (C_0) as shown:

$$\% \text{ analyte depletion} = [1 - ((C1 / C_0) (H0 / H_1))] \times 100 \qquad \text{eq. 2.5}$$

The use of these equations to determine total oil and analyte depletion is considered to be conservative (i.e., to provide minimum depletion estimates) because the hopane degrades very slowly (Douglas *et al*., 1996). Equation 2.5 was used to determine analyte depletion in shoreline sediment samples following the Exxon™ Valdez oil spill. Analyte depletion in these samples ranged from 30 to 70 percent 16 months after the spill (Douglas *et al*., 1996). It also was noted during this study that the relative degree of PAH depletion decreased with increasing ring numbers and increased alkylation.

Similarly, hydrocarbon ratios have been used to determine the degree of change in oil/fuel composition with time and weathering. A ratio that is frequently used to assess biodegradation is the n-C_{17}/pristane ratio. The n-C_{17} compound is simply a saturated 17-carbon alkane. Pristane is a 19-carbon isoalkane, or isoprenoid, that is more resistant to biodegradation than the alkane n-C_{17}. In a study performed by Christensen and Larsen (1993) on biodegradation of residual diesel fuel in soils, the n-C_{17}/pristane ratio had the highest correlation factor with fuel residence time in soils of any similar n-alkane/isoalkane ratio. Based on the results of this study, Christensen and Larsen (1993) determined that the n-C_{17}/pristane ratio could be used to determine the age of a diesel oil spill within a range of plus or minus 2 years at a 95-percent level of confidence. The data also suggested that the n-alkanes biodegrade at a zero-order rate within residually contaminated soils.

2.5.3 BTEX Ratios

For refined petroleum products with higher initial BTEX concentrations (e.g., gasoline), ratios of the BTEX compounds have been used to estimate the relative state of degradation. As noted by Kaplan *et al*. (1996), BTEX results offer an excellent means of evaluating fuel alteration resulting from dissolution and volatilization. Comparing concentration ratios of the BTEX compounds in groundwater samples will typically show that benzene and toluene will be enriched relative to ethylbenzene and xylenes. However, in soil samples ethylbenzene and xylenes are preferentially retained relative to benzene and toluene.

Kaplan *et al*. (1996) suggest that a useful parametric ratio to evaluate gasoline partitioning is (benzene+toluene)/(ethylbenzene+xylenes). Based on their results, the average (B+T)/(E+X) ratio ranged from 0.74 to 0.88 for newly dispensed gasoline, whereas, the average ratio for free product, water, and soil were 0.65, 0.97, and 0.48, respectively. In laboratory studies by Kaplan *et al*. (1996), (B+T)/(E+X) ratios of 1.0 to 5.0 have been found for water in contact with fresh gasoline. At fuel release sites where groundwater samples are collected in the source area and the (B+T)/(E+X) ratio falls within this range, a recent release is indicated. At sites where the gasoline release is more than 10 years old, the ratio in the vicinity of the source area typically is less than 0.5. Ratios greater than 5.0 typically are encountered at sites where the groundwater samples are collected at a distance from the source area, and benzene and toluene concentrations are relatively higher than ethylbenzene and xylenes concentrations because of dissolution effects.

SECTION 3

SELECTION OF STUDY SITES

The primary objective of this study was to determine a range of natural *in-situ* weathering rates for mobile LNAPL associated with jet fuel and gasoline releases based on the existing literature and data collected from sites with mobile LNAPL contamination. Because no case studies identified in the literature quantitatively evaluated source strength reduction of the BTEX constituents within mobile LNAPL, field sampling of representative sites was determined to be necessary. The site selection criteria for the fuel weathering study are presented in Section 3.1. Sites included within the study are summarized in Section 3.2.

3.1 SITE SELECTION CRITERIA

To evaluate a site's potential as a candidate for the fuel weathering study, the following selection criteria were considered:

1. Presence of recoverable mobile LNAPL in the subsurface environment as a result of a jet fuel or gasoline release;
2. Known date of fuel release;
3. Single release confined to a relatively short period of time;
4. Minimal engineered remediation of the site and mobile LNAPL;
5. Availability of historic LNAPL analytical results, including BTEX;
6. Depth to groundwater less than 40 feet below ground surface (bgs) (for ease of sampling); and
7. Department of Defense (DoD) sites (for ease of access).

Identifying sites that met all of the above-listed criteria proved to be a difficult task. Consequently, the criteria served as guidelines for site selection rather than rigid selection parameters. Each of the criteria and their consideration in site selection are briefly discussed below.

JP-4 fuel release sites were preferred for the study because they are common at Air Force bases and JP-4 has a relatively high mass fraction of BTEX (Figure 2.3). Source reduction (i.e., BTEX depletion) estimates using mobile LNAPL sampling data from these types of fuel release sites were anticipated to be more representative because of the higher initial BTEX concentrations. However, due to the difficulty of finding an adequate number of sites meeting the selection criteria, gasoline, JP-5, and JP-8 release sites also were included in the study. While benzene, toluene, and ethylbenzene concentrations are less than 0.40 wt% in JP-8 (Mayfield, 1996), and less than 0.05 wt% in JP-5 (based on the fresh sample collected at Beaufort MCAS), it was hoped that concentrations of total xylenes, naphthalene, and methylnaphthalenes could be used to evaluate mobile LNAPL weathering rates for JP-5 and JP-8.

Recoverable mobile LNAPL was loosely defined during initial site screening as sufficient free product in a site monitoring well to allow collection of relatively undiluted product samples. One inch of mobile LNAPL was considered to be the minimum required thickness for site consideration.

Locating sites with a known date of fuel release (criterion 2) where the release was a one-time event confined to a relatively short period of time (criterion 3) was difficult, especially when combined with the requirement for recoverable mobile LNAPL (criterion 1). For many petroleum release sites, the specific date(s) of release is not documented and at best can be approximated based on known historical site activities. In addition, one-time releases of sufficient volume to produce a long-term mobile LNAPL in the subsurface environment are rare. Moreover, when such releases occur, they frequently trigger emergency response actions that compromise satisfaction of the fourth selection criterion (minimal site remediation).

Sites where limited or no site remediation had occurred were preferred for assessing *in situ* LNAPL weathering rates. Soil venting activities, such as SVE, bioventing, and bioslurping will increase volatilization and biodegradation of the BTEX fraction in LNAPL; therefore, a BTEX weathering evaluation of the mobile LNAPL remaining at such sites would be biased. Sites where limited product recovery or soil excavation has occurred were not excluded from consideration.

Historical mobile LNAPL BTEX sampling results were considered in lieu of a known spill or release date. The availability of BTEX concentrations from a previous sampling event could help define BTEX depletion curves for the mobile LNAPL. Historical LNAPL BTEX results at least 3 years old were desired, but such data were seldom available.

Sites with shallow groundwater (less than 40 feet bgs) were selected so that Geoprobe® sampling could be performed. This requirement precluded the selection of sites in arid regions with thick vadose zones and deep water tables. As a result, many of the sites selected for the study are located in coastal regions with shallower water tables.

During the original fuel weathering study, funding and liability issues restricted the study to DOD sites. During the site selection process for the fuel weathering update, industrial sites were considered for inclusion. However, site selection criterion #4 is typically not fulfilled on industrial sites, because catastrophic releases at these sites trigger legally required emergency response cleanup actions.

3.2 FUEL WEATHERING STUDY SITES

Eight primary sites were selected for the study. A ninth primary site was added during the update phase of this project. Summary information for the original eight primary sites was submitted to AFCEE prior to field sampling activities (Appendix A). In addition, samples from four secondary sites were collected and analyzed to support the study. Summary site data for the primary and secondary sites are provided in Table 3.1. The primary sites are designated as primary because these sites have large and persistent LNAPL plumes present. The secondary sites all have relatively small LNAPL plumes resulting from small fuel releases. The secondary sites were not resampled during the update phase of this study because there was insufficient LNAPL present at these sites.

Based on the site-selection criteria summarized in Section 3.1, sample data from one gasoline, seven JP-4, three JP-5, and two JP-8 fuel release sites were collected to evaluate mobile LNAPL weathering. Table 3.1 provides summary information for each site, including fuel type, volume and date of fuel release, and hydrogeologic information (e.g., soil type, approximate depth of water table, groundwater velocity, and free product or mobile LNAPL thickness). Figure 3.1 illustrates the geographic distribution of the selected sites. The fuel weathering study work plan and site-specific addenda (Appendix A) provide additional information on the primary sites selected for the study. Further information on sample collection methods is presented in Section 4.

TABLE 3.1
SITE SUMMARY
FUEL WEATHERING STUDY

Site/Location	Fuel Type	Date of Release	Spill Age (years)[a/]	Amount Released (gallons)	Soil Type[b/]	Depth to Water Table (feet bgs[c/])	Groundwater Velocity (feet/year)	Free Product Thickness (feet) and Date	References
Primary Sites									
Tank 349 Offutt AFB, NE	Gasoline	1990	13	Unknown	Clay/Sand	39-42	11	2.23(6/96)	Parsons, 1997
Bldg 1610 Shaw AFB, SC	JP-4	June 1994	9	Unknown	Sand	29-33	400	2.5(8/96)	Parsons, 1998
Pipeline Leak Site Myrtle Beach AFB, SC	JP-4	January 1981	22	123,000	Clay/Sand	2-8.5	420	3.79(11/95)	ECT, 1996
Tank 1 Area, DFSP-Charleston, Hanahan, SC	JP-4	October 1975	28	83,000	Clay/Sand	18-22	62	1.77(5/96)	USGS, 1997
Spill Site No. 2 Eaker AFB, AR	JP-4	October 1973	30	Unknown	Sandy Silt	8-14	16	1.18(8/97)	Halliburton NUS, 1996
AGE Area [d/] Seymour Johnson AFB, NC	JP-4	January, 1985	18	Unknown	Sand	4-9	130	0.55(7/01)	NA [e/]
Tank Farm C Beaufort MCAS, SC	JP-5	June 1990	13	10,600	Silty Sand	2-8	20	0.13(5/96)	USGS, 1996
Day Tank 1, Facility 293 Cecil Field NAS, FL	JP-5	1981	22	497,000	Silty Sand	5-8	6	0.78(8/96)	ABB, 1995a; 1996
Bldg 4522 Seymour Johnson AFB, NC	JP-8	December 1995	8	5,000	Sand	4-9	130	2.8(4/96)	Parsons, 1996c
Secondary Sites									
KC-135 Crash Site Wurtsmith AFB, MI	JP-4	October 1988	15	3,000	Sand	9-12	110	0.22(3/91)	Parsons, 1996a
Washrack/Treatment Area McChord AFB, WA	JP-4	1975	28	100,000	Silty Gravel	11-15	NA	0.14(4/94)	EA, 1994
Day Tank 865 Beaufort MCAS, SC	JP-5	1974	29	60,000	Silty Sand	2-8	7	0.15(5/97)	ABB, 1995b
JP-8 Release Site Pope AFB, NC	JP-8	April 1996	7	700	Sand	6-9	100	0.01(7/96)	Parsons, 1996b

[a/] Spill age is calculated from the release date of the draft fuel weathering report update.
[b/] Represents soil type at the capillary fringe/water table.
[c/] Feet below ground surface.
[d/] This site was added during the update phase of this project.
[e/] NA = not available.

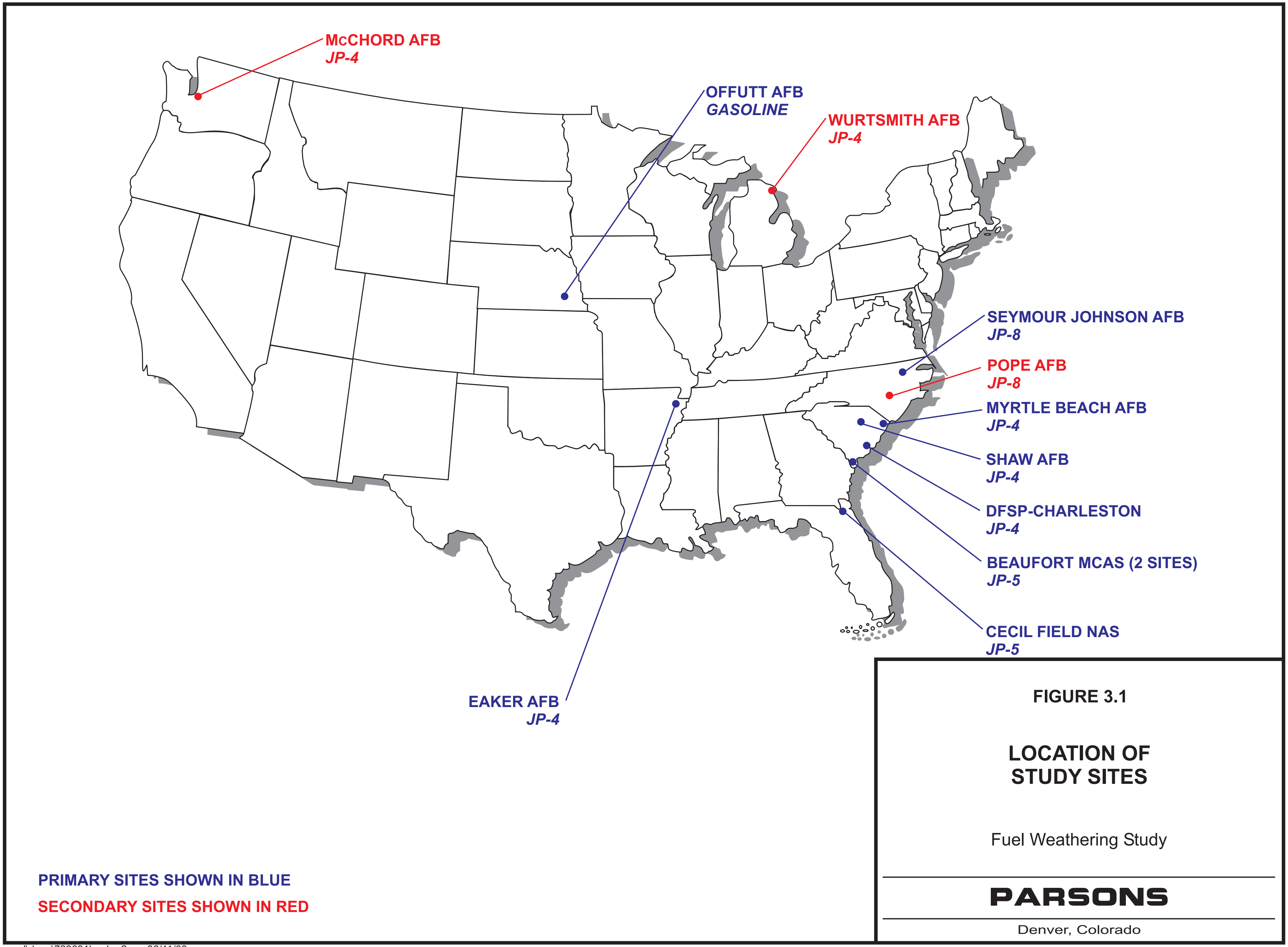


FIGURE 3.1

LOCATION OF STUDY SITES

Fuel Weathering Study

PARSONS

Denver, Colorado

corel\draw\729691b.cdr p2 ma 06/11/03

SECTION 4

COLLECTION OF SITE DATA

To assess the effects of mobile and residual LNAPL weathering as they apply to soil and groundwater, samples of each medium (i.e., soil, groundwater, and mobile LNAPL) were collected from the study sites listed in Table 3.1. Where possible, samples were collected at each site within the area impacted by mobile LNAPL to determine weathering effects on mobile LNAPL in relation to contaminant concentrations in soil at the capillary fringe and in groundwater. Samples collected by Parsons during 1997 and 1998 field sampling events form the foundation for this study; however, samples collected prior to 1997 by other organizations also have been included, where appropriate. LNAPL and groundwater samples collected as part of the fuels weathering study update were collected between July 2001 and July 2002. Table 4.1 provides a summary of the origin and types of samples collected and analyzed for the nine primary and four secondary fuel weathering study sites.

The following subsections provide a summary of soil, mobile LNAPL, and groundwater collection procedures. A brief description of the laboratory analytical methods used for this study also is provided. The work plan provides further information about sample collection and analysis procedures (Appendix A).

4.1 SOIL SAMPLING

Soil samples for the study were collected using a truck-mounted Geoprobe® direct push rig. At most of the selected sites, soil samples were collected from a minimum of two separate borings. To maximize the possibility of obtaining soil samples within areas of measurable mobile LNAPL, boreholes were generally placed as close as possible to monitoring wells displaying maximum mobile LNAPL thickness for the site. Soil samples typically were collected from approximately 1 foot above the water table for the purpose of evaluating weathering of residual LNAPL in the capillary fringe. The collected soil samples were then shipped in soil sampling jars to an offsite laboratory for analysis.

Soil samples were submitted to the US Environmental Protection Agency (USEPA) National Risk Management Research Laboratory (NRMRL) (formerly the Kerr Research Laboratory), in Ada, Oklahoma. Section 4.4 summarizes the soil, mobile LNAPL, and groundwater analytical methods utilized for the study. Soil samples were not collected during the update phase of this project.

TABLE 4.1
ORIGIN OF SAMPLE DATA
FUEL WEATHERING STUDY

Site	Dates of Sample Collection	Sample Type [a/]	Samples Collected By [b/]	Samples Analyzed By [c/]
Primary Sites				
Tank 349	November 1994	S,GW,FP	USACE/Parsons	NRMRL
Offutt AFB, NE	June 1996	GW,FP	Parsons	NRMRL
	June 1997	S,GW,FP	Parsons	EAL, NRMRL
	October 1998	FP	Parsons	EAL, NRMRL
	January 2002	GW,FP	URS Corp.	OBG
Building 1610	March 1997	S,GW,FP	Parsons	EAL, NRMRL
Shaw AFB, SC	March 1998	S,GW,FP	Parsons	EAL, NRMRL
	July 2002	GW,FP	Proterra Inc.	OBG
Pipeline Leak Site	March 1997	S,GW,FP	Parsons	EAL, NRMRL
Myrtle Beach AFB, SC	July 2001	GW,FP	Parsons	OBG
DFSP-Charleston, Tank 1	December 1993	FP	USGS	NRMRL
Area	May 1995	FP	USGS	NRMRL
Hanahan, SC	May 1997	S,GW,FP	Parsons	EAL, NRMRL
	February 2002	GW,FP	IT Corp.	OBG
Spill Site No. 2	August 1997	S,GW,FP	USACE	EAL, NRMRL
Eaker AFB, AR	October 2001	GW,FP	Parsons	OBG
Tank Farm C Beaufort MCAS, SC	August 1997	S,GW,FP	Parsons	EAL, NRMRL
Day Tank 1, Facility 293	May 1997	S,GW,FP	Parsons	EAL, NRMRL
Cecil Field NAS, FL	February 2002	GW,FP	Tetratech NUS	OBG
Bldg 4522	July 1996	S,GW,FP	USACE	NRMRL
Seymour Johnson AFB, NC	May 1997	S,GW,FP	Parsons	EAL, NRMRL
	March 1998	S,GW,FP	Parsons	EAL, NRMRL
	July 2001	GW,FP	Parsons	OBG
Former AGE Facility Seymour Johnson AFB, NC	July 2001	GW,FP	Parsons	OBG
Secondary Sites				
KC-135 Crash Site Wurtsmith AFB, MI	August 1996	S,GW	Parsons ES	NRMRL
Washrack/Treatment Area McChord AFB, WA	September 1997	FP	McChord Contractor	NRMRL
Day Tank 865 Beaufort MCAS, SC	May 1997	S,FP	Parsons ES	NRMRL
JP-8 Release Site Pope AFB, NC	July 1996	S,GW,FP	USACE	NRMRL

[a/] S = soil; GW = groundwater; FP = free product or mobile light nonaqueous phase liquid (LNAPL).
[b/] USACE = US Army Corps of Engineers, Kansas City District Office; USGS = United States Geological Survey, Water Resource Division, Columbia, SC.
[c/] EAL = Evergreen Analytical Laboratory, Wheat Ridge, Colorado; NRMRL = USEPA National Risk Management Research Laboratory, Ada, Oklahoma; OBG = O'Brian Gere Laboratories (Syracuse, NY).

4.2 MOBILE LNAPL SAMPLING

Whenever possible, mobile LNAPL samples were collected from two separate site monitoring wells. At the Seymour Johnson Air Force Base (AFB) and Beaufort MCAS sites, mobile LNAPL was present, and thus collected, at only one site monitoring well. No mobile LNAPL was encountered at the Wurtsmith AFB site.

It was originally proposed in the work plan (Appendix A) that mobile LNAPL, groundwater, and soil sampling would be performed in the same vertical continuum within one borehole. It was proposed that groundwater and mobile LNAPL samples would be collected from temporary monitoring points. Attempts were made to collect mobile LNAPL samples from temporary monitoring points at several sites. At these sites, the temporary monitoring points were located within 4 to 7 feet of monitoring wells that contained mobile LNAPL, and were screened to intersect the top of the water table. After monitoring point placement and some initial groundwater purging, the monitoring points were allowed to recharge for up to 15 hours, with the expectation that a sufficient amount of mobile LNAPL (5 to 10 mL) would flow into the monitoring point for sample collection. Only during the 1998 sampling event at Seymour Johnson could a mobile LNAPL sample be collected from a temporary monitoring point. At all other sites no more than a slight sheen of mobile LNAPL was detected in the temporary monitoring points, and mobile LNAPL samples had to be collected from site monitoring wells.

In order to minimize the effects of evaporation on volatile fuel constituents and to obtain samples representative of the mobile LNAPL present in site formations, mobile LNAPL samples generally were collected from site monitoring wells following an initial purging of mobile LNAPL present in the well casing. Because the rate of mobile LNAPL recovery was unknown, a "pre-purge" sample was collected from site monitoring wells in the event that sufficient mobile LNAPL recovery did not occur following initial purging. At most sites, at least one casing-volume of product was removed, and mobile LNAPL recovery was sufficient for "post-purge" sample collection within an hour or less. Other than the "pre-purge" samples from Beaufort Tank Farm C, Beaufort Day Tank 865, and the Cecil Field NAS site (monitoring well CEF-293-7), the mobile LNAPL samples submitted for laboratory analysis were "post-purge" samples. Mobile LNAPL samples were sent to NRMRL and Evergreen Analytical Laboratory (EAL) in Wheat Ridge, Colorado for analysis (Section 4.4).

During the update phase of this project, all LNAPL samples were collected from pre-existing monitoring wells that contained LNAPL and that were sampled during the original fuel weathering study. LNAPL samples collected during the update were collected in the same manner as those samples collected during the original fuel weathering study. Samples collected during the update sampling were submitted to O’Brien and Gere (OBG) Laboratories for analysis.

4.3 GROUNDWATER SAMPLING

Groundwater samples usually were collected from two locations at each of the selected sites. At sites where the water table was less than 20 feet bgs, groundwater samples were collected from temporary monitoring points placed within the Geoprobe® boreholes created during soil sampling. The boreholes and monitoring points generally were placed within 5 to 7 feet of site monitoring wells displaying maximum mobile

LNAPL thickness. At sites where the groundwater depth was more than 20 feet bgs (i.e., Shaw AFB and Offutt AFB), groundwater samples were collected from existing site monitoring wells that contained mobile LNAPL. In addition, during the 1997 and 1998 sampling events at the Seymour Johnson AFB and Cecil Field NAS sites, one groundwater sample also was collected from an existing site monitoring well which contained mobile LNAPL. Groundwater samples were submitted to NRMRL for analysis.

During the update phase of this project, groundwater samples were collected from existing monitoring wells that contained LNAPL. Efforts were made to sample the same wells during the update phase that were previously sampled. However, in some instances. wells that were previously sampled could not be resampled due to lack of measurable LNAPL or well inaccessibility. In the cases where previously sampled wells could not be resampled, alternate wells were selected for sampling. The groundwater samples were collected by first removing the LNAPL from the well, then collecting a groundwater sample using a bailer or a peristaltic pump. It is possible that some emulsification of mobile LNAPL may have occurred in groundwater samples collected from these monitoring wells. After the groundwater sample was collected, a post-purge LNAPL sample was collected if the LNAPL had recovered sufficiently.

4.4 LABORATORY ANALYSIS

Table 4.2 presents a summary of the analytical methods performed by each laboratory. Analytical results from NRMRL, EAL, and OBG are provided in Appendix B.

4.4.1 National Risk Management Research Laboratory

NRMRL analyzed soil, groundwater, and mobile LNAPL samples from several study sites. Concentrations of BTEX, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and the various TMB isomers were determined for each matrix. In addition, soil samples were analyzed for total fuel carbon, and mobile LNAPL samples were analyzed for fuel density. Samples from the eight primary and four secondary sites (Table 4.1) were submitted to NRMRL for analysis.

4.4.2 Evergreen Analytical Laboratory

EAL analyzed mobile LNAPL samples collected from various study sites in order to determine K_{fw} values at equilibrium saturations. The EAL analyses generally were performed in accordance with procedures from the Cline *et al.* (1991) study. Saturated, equilibrium solutions of the collected fuels in contact with distilled, deionized, organic-free water were prepared in the laboratory. Two mL of fuel were added to 40 mL of water in glass vials having Teflon® septa (a 1:20 fuel to water ratio). Sample vials were agitated for approximately 30 minutes, then allowed to rest for 1 hour in an inverted position. The fuel and deionized water mixture was assumed to be at equilibrium at this point per Cline *et al.* 1991. Following mixing and stabilization, the aqueous phase and the organic (fuel) phase were analyzed separately for determination of BTEX concentrations by USEPA gas chromatography method SW8020 with photoionization detection (GC/PID).

TABLE 4.2
ANALYTICAL PROTOCOLS FOR
SOIL, MOBILE LNAPL, AND GROUNDWATER SAMPLES
FUEL WEATHERING STUDY

MATRIX [a/]	LABORATORY [b/]	NUMBER OF SAMPLES PER SITE	ANALYSIS [c/]	METHOD [d/]
SOIL	NRMRL	2 to 3	BTEX + TMBs	NRMRL SOP equivalent to USEPA SW8020A
			Napthalene and Methylnapthalenes	NRMRL SOP equivalent to USEPA SW8270
			Total Fuel Carbon	
MOBILE LNAPL	NRMRL	1 to 2	BTEX + TMBs	GC/MS (Direct Injection)
			Napthalene and Methylnapthalenes	NRMRL SOP equivalent to USEPA SW8270
			Density	USEPA Method 2710F
	EAL	1 to 2	BTEX (Aqueous Phase)	SW8021
	OBG	2 to 3	BTEX (Aqueous Phase)	SW8021 and SW8260
GROUNDWATER	NRMRL	1 to 2	BTEX + TMBs	NRMRL SOP equivalent to USEPA E602
			Napthalene and Methylnapthalenes	NRMRL SOP equivalent to USEPA SW8270
	OBG	2 to 3	BTEX (Aqueous Phase)	SW8260

[a/] LNAPL = Light nonaqeous phase liquid
[b/] NMRL = National Risk Management Research Laboratory; EAL = Evergreen Analytical Laboratory; OBG = O'Brien and Gere Laboratory.
[c/] BTEX = benzene, toluene, ethylbenzene, and total xylenes; TMBs = trimethylbenzene isomers.
[d/] SOP = Standard operating procedure; GC/MS = Gas chromatography/mass spectrometry.

4.4.3 O'Brien and Gere Laboratories

During the update phase of this project, LNAPL and groundwater samples were shipped to OBG for analysis. OBG analyzed the LNAPL and groundwater samples for VOCs via USEPA Methods SW8260B and SW8021 (Cline *et al.* 1991). The 8260B data were used to calculate BTEX weathering rates from LNAPL and groundwater as well as K_{fw} values at non-equilibrium (field) conditions. The 8021 data were used to calculate fuel/water partitioning coefficients at equilibrium (laboratory) conditions. The 8021 data are equivalent to the data generated by EAL using the Cline *et al*. (1991) method during the original fuel weathering study, in that both the water and LNAPL phases within each sample were analyzed.

SECTION 5

ANALYTICAL RESULTS AND DATA ANALYSIS

The primary objective of this study was to determine a range of natural weathering rates for mobile LNAPLs in order to refine modeling assumptions for the contaminant source-term reduction rate. The BTEX compounds were the primary focus of the study, as they typically represent the primary contaminants of concern at gasoline and jet fuel release sites. Naphthalene and methylnaphthalenes also were evaluated because these aromatic compounds can be contaminants of concern at sites containing releases of kerosene-based jet fuels (i.e., JP-5 and JP-8). In addition to the mobile LNAPL weathering analysis, K_{fw} values for BTEX compounds were determined based on field data and compared to laboratory-determined partitioning values. Lastly, residual LNAPL weathering rates in capillary fringe soils were compared to mobile LNAPL weathering rates.

5.1 RESULTS SUMMARY

Table 5.1 summarizes mobile LNAPL, groundwater, and soil analytical results for the remaining BTEX fraction based on fuel type, and includes sample data from the nine primary and four secondary sites. The mobile LNAPL and groundwater values shown represent analytical results obtained from EAL, NRMRL, and OBG. These data were collected during both the original fuels weathering study and the update. Soil values shown represent analytical results from NRMRL. A more complete listing of analytical results obtained from EAL, NRMRL, and OBG for each site, including naphthalene, methylnaphthalene, and TMB results, is provided in Appendix B.

5.1.1 Mobile LNAPL BTEX Results

Mobile LNAPL BTEX results varied considerably with fuel type. Total BTEX concentrations in mobile LNAPL collected at the fuel release sites ranged from 3,780 mg/L (JP-5) to 111,000 mg/L (gasoline). The most significant variations are apparent in the benzene and toluene fractions, where their concentrations varied over approximately 3 orders of magnitude for the different fuel types. Maximum benzene concentrations of 14,000 mg/L, 2,650 mg/L, 480 mg/L, and 25 mg/L were detected in mobile LNAPL from the gasoline, JP-4, JP-8, and JP-5 fuel release sites, respectively. Maximum toluene concentrations in mobile LNAPL ranged from 122 mg/L at the JP-5 sites to 58,000 mg/L at the gasoline site. Order-of-magnitude differences in the mobile LNAPL BTEX concentrations based on fuel type are consistent with differences in individual BTEX component concentrations among the fresh fuels (Figure 2.3).

TABLE 5.1
BTEX CONTENT IN MOBILE LNAPL, GROUNDWATER, AND SOIL RESULTING FROM GASOLINE AND JET FUEL RELEASES
FUEL WEATHERING STUDY

Fuel Type	No. of	Benzene		Toluene		Ethylbenzene		Xylenes		Total BTEX	
Sample Matrix[a/]	Samples	Range	Average [b/]	Range	Average [b/]	Range	Average [b/]	Range	Average [b/]	Range	Average [b/]
JP-4 Jet Fuel											
Mobile LNAPL (mg/L)[c/]	36	< 0.025 - 2,650	730	< 0.025 - 6,650	1,620	0.075 - 7,360	1,550	0.075 - 26,300	7,660	0.15 - 34,800	11,800
Groundwater (mg/L)	10	0.002 - 20	2.7	0.001 - 8.8	1.4	0.043 - 3.9	0.53	0.025 - 18.8	2.9	0.14 - 43	7.4
Soil (mg/kg)[d/]	14	0.006 - 11	1.5	0.006 - 22	2.5	0.006 - 34	5.5	0.018 - 173	25	0.036 - 230	34
JP-5 Jet Fuel											
Mobile LNAPL (mg/L)	7	1.5 - 25	11.3	13.0 - 122	55	116 - 3,200	970	611 - 7,300	2,740	740 - 10,600	3,780
Groundwater (mg/L)	2	0.002 - 0.09	0.046	0.007 - 0.81	0.41	0.02 - 0.94	0.48	0.14 - 2.8	1.4	0.17 - 4.6	2.4
Soil (mg/kg)	6	0.012 - 3.3	0.94	0.079 - 19	6.3	1.5 - 155	57	0.093 - 425	145	6.9 - 600	208
JP-8 Jet Fuel											
Mobile LNAPL (mg/L)	9	< 0.025 - 480	156	< 0.025 - 1,239	676	63 - 4,040	1,253	1,000 - 7,530	4,690	1,070 - 10,600	6,590
Groundwater (mg/L)	4	0.19 - 0.85	550	0.068 - 4.1	2.0	0.22 - 0.84	0.47	0.69 - 3.2	1.8	1.2 - 9.0	4.8
Soil (mg/kg)	9	0.006 - 13	6.0	0.006 - 79	35	0.006 - 75	38	0.018 - 416	168	0.036 - 561	248
Gasoline											
Mobile LNAPL (mg/L)	10	955 - 14,000	6,840	12,300 - 58,000	38,300	9,260 - 18,000	12,900	32,600 - 84,000	53,000	55,900 - 165,000	111,000
Groundwater (mg/L)	8	1.9 - 38	22	21 - 44	33	3.6 - 4.7	4.1	9.0 - 79	22	27 - 121	75
Soil (mg/kg)	4	0.56 - 43	26	0.33 - 165	88	0.29 - 59	30	0.79 - 203	102	2.0 - 467	247

[a/] Mobile (LNAPL) and groundwater analytical results obtained from EAL, NRMRL, and OBG. Soil analytical results obtained from NRMRL.
[b/] Average = Arithmatic mean.
[c/] mg/L = milligram per liter.
[d/] mg/kg = milligrams per kilogram.

5.1.2 Groundwater BTEX Results

Groundwater BTEX analytical results in the LNAPL source area also varied with fuel type. Groundwater concentrations at the gasoline site consistently exceeded USEPA (2002) MCLs for benzene (0.005 mg/L), toluene (1.0 mg/L), ethylbenzene (0.7 mg/L), and total xylenes (10 mg/L). At the jet fuel release sites where the effective solubility of the BTEX compounds in the LNAPL is significantly lower than in gasoline, MCL exceedances were less frequent. Maximum concentrations of benzene measured at the JP-4, JP-5, and JP-8 release sites exceeded the MCL; however, concentrations in some groundwater samples at the JP-5 and JP-8 sites were below the benzene MCL. Even at the JP-4 sites where fuel releases occurred more than 20 years prior to the sampling event, benzene concentrations in groundwater continued to exceed the MCL. Toluene and ethylbenzene concentrations in contaminant source-area groundwater at the JP-4 and JP-8 sites occasionally exceeded their MCLs, but no MCL exceedances were observed for these analytes in the two JP-5 site samples. Total xylenes concentrations in groundwater at the JP-4, JP-5, and JP-8 release sites were consistently below the MCL of 10 mg/L, indicating that dissolved xylene contamination is not likely to be a significant environmental concern at jet fuel release sites. However, xylene concentrations in groundwater at the gasoline site exceeded the MCL in all samples (Tables 2.1 and 5.1).

5.1.3 Soil BTEX Results

BTEX concentrations detected in capillary fringe soil samples did not vary as significantly with fuel type as did mobile LNAPL and groundwater BTEX concentrations. Maximum benzene concentrations of 43 milligrams per kilogram (mg/kg), 13 mg/kg, 11 mg/kg, and 3.3 mg/kg were measured at the gasoline, JP-8, JP-4, and JP-5 release sites, respectively. Similarly, maximum concentrations of toluene were greatest at the gasoline site (165 mg/kg), followed by the JP-8 sites (79 mg/kg), JP-4 sites (22 mg/kg), and JP-5 sites (19 mg/kg). Surprisingly, maximum soil concentrations of ethylbenzene (155 mg/kg) and total xylenes (425 mg/kg) were detected in the capillary fringe soil sample collected at the Cecil Field NAS JP-5 release site; however, comparatively low concentrations of ethylbenzene and xylenes were detected in the mobile LNAPL sample collected near this location (3,200 mg/L and 7,300 mg/L, respectively).

5.2 MOBILE LNAPL WEATHERING

Mobile LNAPL weathering was assessed by evaluating the mass fraction reduction of the individual BTEX constituents as well as of total BTEX. BTEX concentrations in mobile LNAPL samples were compared to assumed initial BTEX concentrations in fresh fuel that are believed to be conservatively low as described in Section 2.1.2.4. Using the known dates of the product releases and the assumed initial BTEX compositions for the various fuels, the degree of mobile LNAPL weathering (i.e., BTEX mass fraction depletion) that has occurred with time was determined for each release site.

5.2.1 Assumed Initial Fuel Compositions

Initial concentrations of BTEX, naphthalene, and methylnaphthalenes in gasoline, JP-4, JP-5, and JP-8 that are believed to be conservatively low were assumed. The assumed initial concentration for each fuel type is based on the following literature-derived or laboratory-measured values presented in Section 2.1.2.4:

- JP-4 - Initial values from Smith *et al*. (1981);
- JP-5 at Cecil Field NAS - Initial values from Hughes *et al*. (1984);
- JP-5 at Beaufort MCAS - Initial values based on Beaufort MCAS fresh JP-5 sample;
- JP-8 - Initial values from Mayfield (1996); and
- Gasoline - Initial values from Tojado and Ray (1987).

Further discussion of the assumed fuel compositions for JP-4, JP-5, JP-8, and gasoline in relation to site-specific mobile LNAPL results is presented in Sections 5.2.3, 5.2.4, 5.2.5, and 5.2.6, respectively.

5.2.2 Kinetics of Weathering

As discussed in Section 2, LNAPL weathering in the subsurface environment results from a complex combination of physical, chemical, and biological processes. Weathering rates, or compound-specific depletion rates, are a function of these processes. Thus, the reaction kinetics that determines the rate of contaminant depletion are difficult to predict. For this study, no literature findings were identified that explained reaction kinetics for the overall weathering of a mobile LNAPL, and for most sites, only a few data points were available for estimating contaminant depletion rates. Because of these limitations, contaminant depletion in this study was evaluated using both zero-order and first-order reaction kinetics.

5.2.2.1 Zero-Order Weathering

Zero-order weathering or decay is described by the following differential equation:

$$dC / dt = - k_0 \qquad \text{eq. 5.1}$$

As shown on Figure 5.1, zero-order, or linear, weathering assumes that contaminant depletion in the mobile LNAPL occurs at a constant rate (k_0). In addition, the rate of depletion of the contaminant is not reduced as the contaminant becomes increasingly more depleted with time and weathering of the mobile LNAPL. Solving this differential equation gives:

$$C = C_0 - k_0 t \qquad \text{eq. 5.2}$$

where: C = contaminant concentration (wt%) at time "t"

C_0 = contaminant concentration (wt%) at time “zero”

k_0 = zero-order rate constant or slope (wt% per year)

Solving for k_0, eq. 5.2 can be written as:

$$k_0 = (C_0 - C) / t \qquad \text{eq. 5.3}$$

FIGURE 5.1
EXAMPLE OF ZERO-ORDER CONTAMINANT WEATHERING
FUEL WEATHERING STUDY

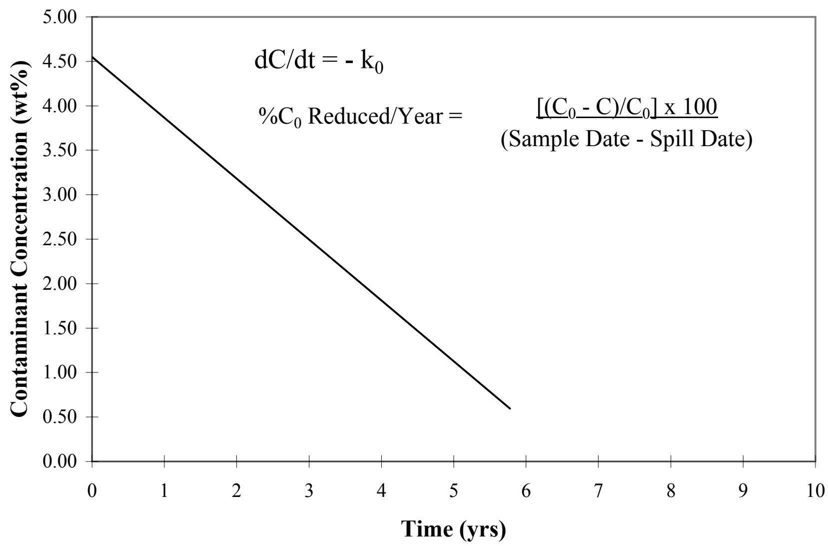
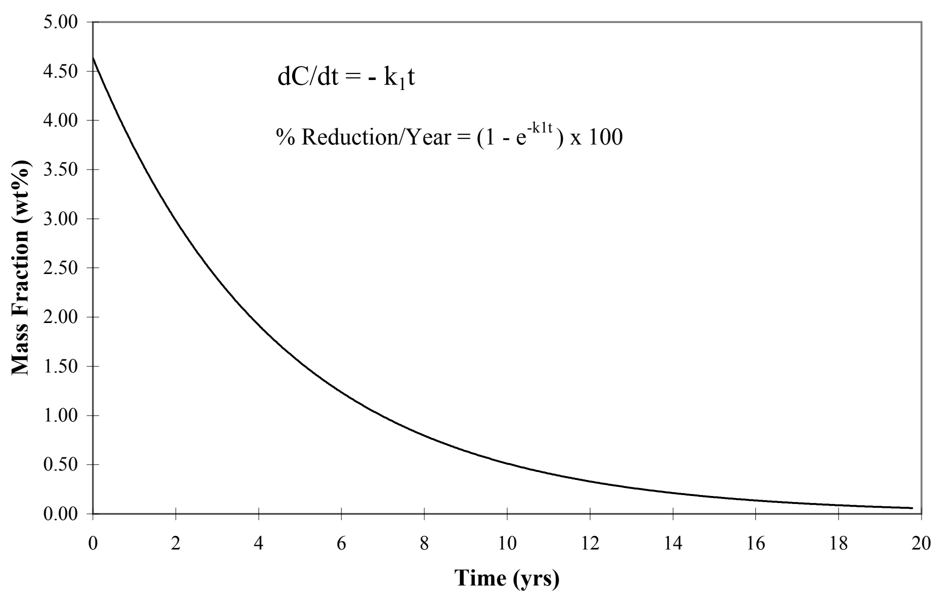


FIGURE 5.2
EXAMPLE OF FIRST-ORDER CONTAMINANT WEATHERING
FUEL WEATHERING STUDY



For zero-order weathering, the amount or percent of annual contaminant depletion can be compared to the concentration at time zero (C_0) by the following:

$$\% \ C_0 \text{ Reduced / Year} = \frac{[\,(C0 - C\,) / C_0\,] \times 100}{\text{Sample Date - Spill Date (years)}} \qquad \text{eq. 5.4}$$

5.2.2.2 First-Order Weathering

First-order weathering is described by the following differential equation:

$$dC / dt = - k_1 t \qquad \text{eq. 5.5}$$

As shown on Figure 5.2, the rate of contaminant depletion changes with time under the first-order weathering assumption. Under this scenario, the rate of contaminant depletion is proportional to the amount of contaminant that is present at any time "t." The first-order weathering curve shown on Figure 5.2 is an exponential curve, where the amount of contaminant remaining in the LNAPL approaches zero with time, but never reaches a zero concentration. Solving this differential equation gives:

$$C = C_0 e^{-k_1 t} \qquad \text{eq. 5.6}$$

where: C = contaminant concentration in wt% at time "t"

C_0 = contaminant concentration in wt% at time "zero"

e = base of natural logarithms (approximately 2.72)

k_1 = first-order rate constant (years^{-1} or 1/years)

Solving for k_1, eq. 5.6 can be written as:

$$k_1 = - \ln (C/C_0) / t \qquad \text{eq. 5.7}$$

For first-order weathering, the yearly percent of contaminant depletion can be determined as follows:

$$\% \text{ Reduction / Year} = (1 - e^{-k_1 t}) \times 100 \qquad \text{eq. 5.8}$$

As discussed in Sections 2.3.1 and 2.3.2, the dissolution and volatilization of a compound is controlled by the amount (mole fraction) of that compound in the LNAPL under equilibrium conditions. Therefore, the rate of contaminant depletion resulting from dissolution or volatilization also may be proportional to the contaminant concentration, indicating first-order weathering may be more appropriate, especially if one of these weathering mechanisms predominates.

5.2.3 Weathering in JP-4 Mobile LNAPL

Weathering or depletion rates for the BTEX and naphthalene compounds were evaluated at six JP-4 release sites with spill ages ranging between approximately 3 and 28 years. At the McChord AFB site, only one sampling event was performed. At the remaining sites, analytical data from more than one sampling event were evaluated.

Initial composition values for JP-4 were assumed to be equivalent to concentrations reported by Smith *et al*. (1981). For each of the BTEX compounds, composition values presented by Smith *et al* (1981) are slightly lower than the values presented by Hughes *et al*. (1984) (Figure 2.3), and therefore are more conservative for use in estimating BTEX depletion rates. However, it should be noted that the Hughes *et al*. (1984) study considered a larger sample database than the Smith *et al*. (1981) study, and is considered the preeminent study on JP-4 jet fuel composition.

5.2.3.1 Range of Weathering Rates for the Six JP-4 Sites

Mobile LNAPL weathering rates for the JP-4 sites were determined for the BTEX constituents, total BTEX, naphthalene, methylnaphthalene, and TMBs. For these analyses, rate constants k_0 and k_1 were determined for each sample result by solving equations 5.3 and 5.7. Annual contaminant mass reduction rates, based on zero-order and first-order weathering assumptions, were determined for each sample result by solving equations 5.4 and 5.8, respectively. These calculations can be performed with a known contaminant concentration at only one-point in time relative to the known spill date and fresh product contaminant concentrations. Thus, weathering rates determined using this method are hereafter referred to as "one-point" weathering rates.

Using this method, constituent weathering rates were determined for each site during each sampling event. For sites where there were multiple sampling events conducted, benzene and total BTEX weathering rates were averaged across all of the sampling events to determine average weathering rates through the life of each LNAPL plume. The results of these calculations are summarized in Table 5.2. As shown, minimum, maximum, and average values for the rate constants k_0 and k_1 and annual contaminant reduction rates based on zero-order and first-order weathering are presented. In addition, assumed initial concentrations (Smith *et al*., 1981) and average remaining concentrations during each sampling event are shown for comparison purposes. In some cases, the average remaining concentration detected during a particular round exceeded the initial concentration. This could be the result of sampling variability or a continuing source.

As shown in Table 5.2, the weathering rates determined for each site vary significantly between sample collection rounds. The observed trend in calculated compound-specific weathering rates is that the earliest weathering rates are the highest and rates tend to decrease with each successive sampling round. This indicates that as a fuel LNAPL plume ages, it weathers at a slower rate. Thus, weathering rates will be highest in new fuel plumes and lowest in older LNAPL plumes following a first-order decay curve. These observations indicate that the rate at which an LNAPL plume weathers is dependant upon the concentration of each contaminant within the LNAPL plume. For example, in the case of a relatively recent spill, the contaminant concentrations within the LNAPL would be relatively high (close to concentrations measured within fresh fuel). Thus, the contaminant concentration gradient from the LNAPL to groundwater would be relatively steep, resulting in more-rapid migration of contaminant mass from the LNAPL to groundwater. In the case of an older plume, the contaminant concentrations within the LNAPL would be expected to be relatively low, and the contaminant concentration

TABLE 5.2
FUEL RELATED COMPOUND (ONE POINT)[a/] WEATHERING RATES IN JP-4 MOBILE LNAPL
FUEL WEATHERING STUDY

Site / Analyte	Approximate Spill Age[b/]	Number of Samples	Assumed Initial Conc. (C_o)[c/] (wt%)[d/]	Average Remaining Conc. (C) (wt %)	ZERO ORDER: Rate Constant k_0[e/] min	max	avg	% C_o Reduced/Year[f/] min	max	avg		FIRST ORDER: Rate Constant k_1[g/] min	max	avg	% Reduction/Year[h/] min	max	avg
<u>**Shaw AFB, SC**</u>	**2.8**																
Benzene		2	0.50	0.4704	0.07	0.12	0.10	14.9	23.4	**19.2**		0.19	0.38	0.28	17.5	31.4	**24.4**
Toluene		2	1.33	0.9598	0.25	0.37	0.31	18.8	27.5	23.1		0.27	0.51	0.39	23.3	40.2	31.8
Ethylbenzene		2	0.37	0.2946	0.07	0.09	0.08	19.0	24.5	21.8		0.27	0.41	0.34	23.7	33.6	28.6
Total Xylenes		2	2.32	1.9860	0.44	0.52	0.48	18.8	22.6	20.7		0.27	0.35	0.31	23.3	29.8	26.6
Total BTEX		2	4.52	3.7108	0.83	1.10	0.96	18.4	24.3	**21.3**		0.26	0.40	0.33	22.6	33.1	**27.9**
1,2,3-Trimethylbenzene		2	0.00	0.8736	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		2	1.01	1.6866	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3,5-Trimethylbenzene		2	0.42	0.9759	---	---	---	---	---	---	---	---	---	---	---	---	---
Naphthalene		2	0.50	0.3303	0.11	0.13	0.12	22.9	25.6	24.2		0.36	0.44	0.40	30.4	35.9	33.1
1-MethylNaphthalene		2	0.78	0.3250	0.21	0.23	0.22	27.4	29.9	28.6		0.51	0.63	0.57	40.1	46.8	43.5
2-MethylNaphthalene		2	0.56	0.5376	0.09	0.12	0.11	15.6	22.0	18.8		0.20	0.34	0.27	18.5	28.7	23.6
Total Naphthalenes		2	1.84	1.1929	0.42	0.48	0.45	22.6	26.3	24.4		0.35	0.47	0.41	29.8	37.5	33.7
<u>**Shaw AFB, SC**</u>	**3.8**																
Benzene		2	0.50	0.1863	0.08	0.09	0.08	15.2	18.0	**16.6**		0.23	0.30	0.26	20.3	26.0	**23.1**
Toluene		2	1.33	0.3931	0.24	0.26	0.25	18.0	19.2	18.6		0.30	0.34	0.32	26.1	29.1	27.6
Ethylbenzene		2	0.37	0.1355	0.06	0.06	0.06	16.6	16.9	16.8		0.26	0.27	0.27	23.0	23.7	23.3
Total Xylenes		2	2.32	0.9242	0.37	0.37	0.37	15.9	16.0	15.9		0.24	0.24	0.24	21.5	21.7	21.6
Total BTEX		2	4.52	1.6392	0.75	0.78	0.76	16.5	17.2	**16.9**		0.26	0.28	0.27	22.8	24.3	**23.6**
1,2,3-Trimethylbenzene		2	0.00	0.8997	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		2	1.01	0.2704	0.02	0.04	0.03	1.9	3.9	2.9		0.02	0.04	0.03	1.9	4.1	3.0
1,3,5-Trimethylbenzene		2	0.42	0.1638	0.04	0.04	0.04	8.7	10.2	9.4		0.11	0.13	0.12	10.0	12.0	11.0
Naphthalene		2	0.50	0.3847	0.09	0.09	0.09	17.5	18.1	17.8		0.29	0.30	0.30	24.9	26.2	25.6
1-MethylNaphthalene		2	0.78	0.8997	0.16	0.17	0.16	20.7	21.2	21.0		0.40	0.43	0.42	33.3	34.9	34.1
2-MethylNaphthalene		2	0.56	0.2704	0.07	0.08	0.08	13.1	14.4	13.8		0.18	0.21	0.19	16.6	18.8	17.7
Total Naphthalenes		2	1.84	0.1638	0.32	0.34	0.33	17.5	18.3	17.9		0.29	0.31	0.30	25.0	26.8	25.9
<u>**Shaw AFB, SC**</u>	**8.1**																
Benzene		4	0.50	0.1256	0.04	0.05	0.05	8.5	10.3	**9.2**		0.14	0.23	0.17	13.5	20.2	**15.9**
Toluene		4	1.33	0.3558	0.12	0.12	0.12	8.9	9.2	9.0		0.16	0.17	0.16	14.5	15.6	15.0
Ethylbenzene		4	0.37	0.1538	0.03	0.03	0.03	7.2	7.2	7.2		0.11	0.11	0.11	10.2	10.2	10.2
Total Xylenes		4	2.32	1.4103	0.10	0.13	0.11	4.1	5.5	4.8		0.05	0.07	0.06	4.9	7.0	6.0
Total BTEX		4	4.52	2.0455	0.29	0.32	0.30	6.5	7.1	**6.7**		0.09	0.11	0.10	8.8	10.0	**9.3**
1,2,3-Trimethylbenzene		4	0.00	0.5897	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		4	1.01	1.4423	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3,5-Trimethylbenzene		4	0.42	0.4712	---	---	---	---	---	---	---	---	---	---	---	---	---
Naphthalene		4	0.50	0.1080	0.05	0.05	0.05	9.5	10.0	9.6		0.18	0.20	0.19	16.5	18.5	17.2
Benzene								8.5	23.4	**15.0**					13.5	31.4	**21.2**
BTEX								6.5	24.3	**15.0**					8.8	33.1	**20.2**

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TABLE 5.2 (Continued)

FUEL RELATED COMPOUND (ONE POINT)[a/] WEATHERING RATES IN JP-4 MOBILE LNAPL

FUEL WEATHERING STUDY

Site	Approximate	Number of	Assumed Initial Conc. (C_o)[c/]	Average Remaining Conc. (C)	ZERO ORDER							FIRST ORDER					
					Rate Constant k_0 [e/]			% C_o Reduced/Year [f/]				Rate Constant k_1 [g/]			% Reduction/Year [h/]		
Analyte	Spill Age[b/]	Samples	(wt%) [d/]	(wt %)	min	max	avg	min	max	avg		min	max	avg	min	max	avg
Myrtle Beach AFB, SC	**16.2**																
Benzene		2	0.50	0.0177	0.03	0.03	0.03	5.8	6.1	**6.0**		0.18	0.26	0.22	16.3	23.0	**19.6**
Toluene		2	1.33	0.0009	0.08	0.08	0.08	6.2	6.2	6.2		0.44	0.46	0.45	35.9	37.1	36.5
Ethylbenzene		2	0.37	0.1299	0.01	0.02	0.01	3.2	4.9	4.0		0.04	0.10	0.07	4.3	9.1	6.7
Total Xylenes		2	2.32	0.4240	0.11	0.13	0.12	4.7	5.4	5.1		0.09	0.13	0.11	8.3	12.3	10.3
Total BTEX		2	4.52	0.5726	0.23	0.26	0.24	5.1	5.7	**5.4**		0.11	0.16	0.13	10.3	14.4	**12.3**
1,2,3-Trimethylbenzene		2	0.00	0.3210	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		2	1.01	0.7357	0.01	0.02	0.02	1.2	2.2	1.7		0.01	0.03	0.02	1.3	2.7	2.0
1,3,5-Trimethylbenzene		2	0.42	0.3787	0.00	0.01	0.00	-0.8	2.0	0.6		-0.01	0.02	0.01	-0.7	2.4	0.8
Naphthalene		2	0.50	0.1219	0.02	0.03	0.02	4.3	5.1	4.7		0.07	0.11	0.09	7.0	10.1	8.5
1-MethylNaphthalene		2	0.78	0.1527	0.04	0.04	0.04	4.8	5.1	5.0		0.09	0.11	0.10	8.9	10.4	9.6
2-MethylNaphthalene		2	0.56	0.2178	0.02	0.02	0.02	3.4	4.2	3.8		0.05	0.07	0.06	4.8	6.7	5.7
Total Naphthalenes		2	1.84	0.4924	0.08	0.09	0.08	4.2	4.8	4.5		0.07	0.09	0.08	6.9	9.0	7.9
Myrtle Beach AFB, SC	**20.6**																
Benzene		2	0.50	0.0190	0.02	0.02	0.02	4.6	4.7	**4.7**		0.14	0.18	0.16	13.4	16.6	**15.0**
Toluene		2	1.33	0.0018	0.06	0.06	0.06	4.9	4.9	4.9		0.31	0.33	0.32	26.9	28.1	27.5
Ethylbenzene		2	0.37	0.1230	0.01	0.01	0.01	2.6	3.9	3.2		0.04	0.08	0.06	3.7	7.4	5.6
Total Xylenes		2	2.32	0.0966	0.10	0.11	0.11	4.5	4.8	4.7		0.13	0.21	0.17	12.2	18.7	15.4
Total BTEX		2	4.52	0.2404	0.20	0.21	0.21	4.5	4.7	**4.6**		0.12	0.18	0.15	11.6	16.1	**13.8**
1,2,3-Trimethylbenzene		2	0.00	0.2650	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		2	1.01	1.0700	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3,5-Trimethylbenzene		2	0.42	0.1550	0.01	0.02	0.01	2.4	3.7	3.1		0.03	0.07	0.05	3.3	6.7	5.0
Naphthalene		2	0.50	0.1450	0.02	0.02	0.02	3.4	3.5	3.5		0.06	0.06	0.06	5.7	6.0	5.8
				Benzene				4.6	6.1	**5.3**					13.4	23.0	**17.3**
				BTEX				4.5	5.7	**5.0**					10.3	16.1	**13.1**
DFSP-Charleston, SC	**18.2**																
Benzene		1	0.50	0.0013			0.03			**5.5**				0.33			**27.9**
Toluene		1	1.33	0.0057			0.07			5.5				0.30			25.9
Ethylbenzene		1	0.37	0.0478			0.02			4.8				0.11			10.6
Total Xylenes		1	2.32	0.1871			0.12			5.1				0.14			12.9
Total BTEX		1	4.52	0.2419			0.24			**5.2**				0.16			**14.9**
1,2,3-Trimethylbenzene		1	0.00	0.0778			---			---				---			---
1,2,4-Trimethylbenzene		1	1.01	0.1750			0.05			4.5				0.10			9.2
1,3,5-Trimethylbenzene		1	0.42	0.0992			0.02			4.2				0.08			7.6
Naphthalene		1	0.50	0.0582			0.02			4.9				0.12			11.2
1-MethylNaphthalene		1	0.78	0.1899			0.03			4.2				0.08			7.5
2-MethylNaphthalene		1	0.56	0.2246			0.02			3.3				0.05			4.9
Total Naphthalenes		1	1.84	0.4728			0.08			4.1				0.07			7.2

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TABLE 5.2 (Continued)
FUEL RELATED COMPOUND (ONE POINT)[a/] WEATHERING RATES IN JP-4 MOBILE LNAPL
FUEL WEATHERING STUDY

Site			Assumed Initial	Average Remaining	ZERO ORDER							FIRST ORDER					
	Approximate	Number of	Conc. (C_o)[c/]	Conc. (C)	Rate Constant k_0 [e/]			% C_o Reduced/Year [f/]				Rate Constant k_1 [g/]			% Reduction/Year [h/]		
Analyte	Spill Age[b/]	Samples	(wt%) [d/]	(wt %)	min	max	avg	min	max	avg		min	max	avg	min	max	avg
DFSP-Charleston, SC	**19.6**																
Benzene		2	0.50	0.0135	0.02	0.03	0.02	4.8	5.1	**5.0**		0.15	0.61	0.38	13.8	45.7	**29.8**
Toluene		2	1.33	0.0043	0.07	0.07	0.07	5.1	5.1	5.1		0.28	0.32	0.30	24.2	27.2	25.7
Ethylbenzene		2	0.37	0.1401	0.00	0.02	0.01	1.3	5.0	3.2		0.02	0.20	0.11	1.5	18.5	10.0
Total Xylenes		2	2.32	0.4419	0.07	0.12	0.10	3.2	5.0	4.1		0.05	0.23	0.14	4.9	20.6	12.8
Total BTEX		2	4.52	0.5998	0.17	0.23	0.20	3.8	5.1	**4.4**		0.07	0.25	0.16	6.7	22.0	**14.3**
1,2,3-Trimethylbenzene		2	0.00	0.1401	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		2	1.01	0.2734	0.03	0.04	0.04	3.4	4.1	3.7		0.05	0.08	0.07	5.3	7.9	6.6
1,3,5-Trimethylbenzene		2	0.42	0.1096	0.01	0.02	0.02	3.3	4.2	3.8		0.05	0.09	0.07	5.3	8.5	6.9
Naphthalene		2	0.50	0.1163	0.02	0.02	0.02	3.7	4.1	3.9		0.07	0.08	0.08	6.4	8.0	7.2
1-MethylNaphthalene		2	0.78	0.2246	0.03	0.03	0.03	3.5	3.8	3.6		0.06	0.07	0.06	5.8	6.6	6.2
2-MethylNaphthalene		2	0.56	0.3005	0.01	0.01	0.01	2.1	2.6	2.4		0.03	0.04	0.03	2.6	3.7	3.2
Total Naphthalenes		2	1.84	0.6413	0.06	0.06	0.06	3.2	3.4	3.3		0.05	0.06	0.05	5.0	5.5	5.2
DFSP-Charleston, SC	**21.9**																
Benzene		3	0.50	0.0000	0.02	0.02	0.02	4.6	4.6	**4.6**		0.38	0.55	0.50	31.8	42.5	**38.9**
Toluene		3	1.33	0.0101	0.06	0.06	0.06	4.5	4.6	4.6		0.18	0.41	0.29	16.5	33.9	24.8
Ethylbenzene		3	0.37	0.0490	0.01	0.02	0.01	3.2	4.5	4.0		0.05	0.16	0.11	5.3	14.8	10.7
Total Xylenes		3	2.32	0.2250	0.08	0.11	0.10	3.5	4.5	4.2		0.06	0.18	0.14	6.2	16.7	13.0
Total BTEX		3	4.52	0.2841	0.18	0.21	0.20	3.9	4.6	**4.3**		0.09	0.20	0.16	8.2	18.4	**14.5**
1,2,3-Trimethylbenzene		3	0.00	0.1134	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		3	1.01	0.2174	0.03	0.04	0.04	3.3	4.2	3.6		0.06	0.11	0.08	5.7	10.3	7.3
1,3,5-Trimethylbenzene		3	0.42	0.0967	0.01	0.02	0.01	3.1	3.9	3.5		0.05	0.08	0.07	5.1	8.1	6.7
Naphthalene		3	0.50	0.0802	0.02	0.02	0.02	3.5	4.1	3.9		0.07	0.10	0.09	6.4	9.6	8.3
1-MethylNaphthalene		3	0.78	0.2144	0.02	0.03	0.03	3.0	3.5	3.3		0.05	0.07	0.06	4.7	6.5	5.9
2-MethylNaphthalene		3	0.56	0.2748	0.01	0.02	0.01	1.6	2.8	2.3		0.02	0.04	0.03	1.9	4.2	3.3
Total Naphthalenes		3	1.84	0.5694	0.05	0.06	0.06	2.7	3.5	3.2		0.04	0.06	0.06	4.0	6.2	5.4
DFSP-Charleston, SC	**26.4**																
Benzene		3	0.50	0.0027	0.02	0.02	0.02	3.8	3.8	**3.8**		0.17	0.23	0.21	16.0	20.7	**18.5**
Toluene		3	1.33	0.1010	0.04	0.05	0.05	2.9	3.8	3.5		0.06	0.27	0.19	5.5	23.6	17.0
Ethylbenzene		3	0.37	0.0920	0.01	0.01	0.01	1.6	3.6	2.8		0.02	0.12	0.07	2.1	11.0	6.8
Total Xylenes		3	2.32	0.4924	0.04	0.09	0.07	1.7	3.7	3.0		0.02	0.15	0.09	2.3	13.8	8.5
Total BTEX		3	4.52	0.6881	0.10	0.17	0.15	2.3	3.7	**3.2**		0.04	0.16	0.10	3.5	14.8	**9.7**
1,2,3-Trimethylbenzene		3	0.00	0.1030	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		3	1.01	0.2600	0.03	0.03	0.03	2.7	3.1	2.8		0.05	0.07	0.05	4.5	6.3	5.1
1,3,5-Trimethylbenzene		3	0.42	0.0897	0.01	0.01	0.01	2.8	3.2	3.0		0.05	0.07	0.06	5.0	6.9	5.8
Naphthalene		3	0.50	0.1267	0.01	0.01	0.01	2.7	3.0	2.8		0.05	0.06	0.05	4.5	5.6	5.1
1-MethylNaphthalene		3	0.78														
2-MethylNaphthalene		3	0.56														
Total Naphthalenes		3	1.84														
					BTEX			2.3	5.2	**4.3**					3.5	22.0	**13.3**

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TABLE 5.2 (Continued)
FUEL RELATED COMPOUND (ONE POINT)[a/] WEATHERING RATES IN JP-4 MOBILE LNAPL
FUEL WEATHERING STUDY

Site / Analyte	Approximate Spill Age[b/]	Number of Samples	Assumed Initial Conc. (C_o)[c/] (wt%)[d/]	Average Remaining Conc. (C) (wt %)	ZERO ORDER: Rate Constant k_0[e/] min	max	avg	% C_o Reduced/Year[f/] min	max	avg		FIRST ORDER: Rate Constant k_1[g/] min	max	avg	% Reduction/Year[h/] min	max	avg
					BENZENE			3.8	5.5	**4.7**					13.8	45.7	**28.8**
Eaker AFB, AR	**23.9**																
Benzene		2	0.50	0.0586	0.02	0.02	0.02	3.2	4.2	**3.7**		0.06	0.30	0.18	5.9	26.2	**16.0**
Toluene		2	1.33	0.0000	0.06	0.06	0.06	4.2	4.2	4.2		0.54	0.54	0.54	41.7	41.7	41.7
Ethylbenzene		2	0.37	0.3547	0.00	0.00	0.00	-0.2	0.5	0.2		0.00	0.01	0.00	-0.2	0.5	0.2
Total Xylenes		2	2.32	1.3371	0.01	0.07	0.04	0.6	3.0	1.8		0.01	0.05	0.03	0.6	5.0	2.8
Total BTEX		2	4.52	1.7504	0.08	0.15	0.12	1.9	3.3	**2.6**		0.02	0.06	0.04	2.4	6.1	**4.3**
1,2,3-Trimethylbenzene		2	0.00	0.3511	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		2	1.01	1.1200	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3,5-Trimethylbenzene		2	0.42	0.5992	---	---	---	---	---	---	---	---	---	---	---	---	---
Naphthalene		2	0.50	0.1337	0.02	0.02	0.02	3.0	3.1	3.1		0.05	0.06	0.06	5.2	5.5	5.4
1-MethylNaphthalene		3	0.78	0.2455	0.02	0.02	0.02	2.7	3.1	2.9		0.04	0.06	0.05	4.2	5.4	4.8
2-MethylNaphthalene		3	0.56	0.4472	0.00	0.01	0.00	0.3	1.4	0.8		0.00	0.02	0.01	0.3	1.6	1.0
Total Naphthalenes		3	1.84	0.8264	0.04	0.05	0.04	2.1	2.6	2.3		0.03	0.04	0.03	2.8	3.9	3.3
Eaker AFB, AR	**28.0**																
Benzene		2	0.50	0.1106	0.01	0.02	0.01	2.0	3.6	**2.8**		0.03	0.22	0.12	2.9	19.4	**11.1**
Toluene		2	1.33	0.0013	0.05	0.05	0.05	3.6	3.6	3.6		0.24	0.26	0.25	21.1	23.2	22.2
Ethylbenzene		2	0.37	0.3450	0.00	0.00	0.00	-0.7	1.2	0.2		-0.01	0.01	0.00	-0.6	1.4	0.4
Total Xylenes		2	2.32	1.3650	0.00	0.06	0.03	0.2	2.8	1.5		0.00	0.05	0.03	0.2	5.1	2.7
Total BTEX		2	4.52	1.6954	0.06	0.14	0.10	1.3	3.1	**2.2**		0.02	0.08	0.05	1.6	7.4	**4.5**
1,2,3-Trimethylbenzene		2	0.00	0.3300	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene		2	1.01	1.2000	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3,5-Trimethylbenzene		2	0.42	0.5900	---	---	---	---	---	---	---	---	---	---	---	---	---
Naphthalene		2	0.50	0.1600	0.01	0.01	0.01	2.4	2.5	2.4		0.04	0.04	0.04	3.8	4.2	4.0
						BTEX		1.3	3.3	**2.4**					1.6	7.4	**4.4**
						BENZENE		2.0	4.2	**3.2**					2.9	26.2	**13.6**
McChord AFB, WA	**22.3**																
Benzene		1	0.50	0.0000			0.02			**4.5**				0.54			**41.7**
Toluene		1	1.33	0.0000			0.06			4.5				0.58			44.2
Ethylbenzene		1	0.37	0.0000			0.02			4.5				0.53			40.9
Total Xylenes		1	2.32	0.0000			0.10			4.5				0.56			42.8
Total BTEX		1	4.52	0.0000			0.20			**4.5**				0.56			**42.8**
1,2,3-Trimethylbenzene		1	0.00	0.0065			---			---				---			---
1,2,4-Trimethylbenzene		1	1.01	0.0052			0.05			4.5				0.24			21.0
1,3,5-Trimethylbenzene		1	0.42	0.0005			0.02			4.5				0.30			26.0
Naphthalene		1	0.50	0.0000			0.02			4.5				0.54			41.7
1-MethylNaphthalene		1	0.78	0.0155			0.03			4.4				0.18			16.1

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TABLE 5.2 (Continued)
FUEL RELATED COMPOUND (ONE POINT)[a/] WEATHERING RATES IN JP-4 MOBILE LNAPL
FUEL WEATHERING STUDY

Site / Analyte	Approximate Spill Age[b/]	Number of Samples	Assumed Initial Conc. (C_o)[c/] (wt%)[d/]	Average Remaining Conc. (C) (wt %)	ZERO ORDER Rate Constant k_0[e/] min	max	avg	% C_o Reduced/Year[f/] min	max	avg	FIRST ORDER Rate Constant k_1[g/] min	max	avg	% Reduction/Year[h/] min	max	avg
2-MethylNaphthalene		1	0.56	0.0143			0.02			4.4			0.16			15.1
Total Naphthalenes		1	1.84	0.0298			0.08			4.4			0.18			16.9
Seymour Johnson AFB, NC	**16.6**															
Benzene		2	0.50	0.0231	0.03	0.03	0.03	5.5	6.0	**5.8**	0.15	0.33	0.24	13.6	28.1	**20.9**
Toluene		2	1.33	0.2580	0.05	0.08	0.06	3.9	5.9	4.9	0.06	0.22	0.14	6.0	19.6	12.8
Ethylbenzene		2	0.37	0.1610	0.01	0.02	0.01	2.3	4.5	3.4	0.03	0.08	0.06	2.8	8.1	5.4
Total Xylenes		2	2.32	1.5000	0.03	0.07	0.05	1.4	2.9	2.1	0.02	0.04	0.03	1.5	3.9	2.7
Total BTEX		2	4.52	1.9421	0.15	0.16	0.16	3.3	3.6	**3.4**	0.05	0.06	0.05	4.6	5.4	**5.0**
1,2,3-Trimethylbenzene		2	0.00	0.2400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene		2	1.01	1.0150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene		2	0.42	0.3400	0.00	0.01	0.00	-0.1	2.4	1.1	0.00	0.03	0.01	-0.1	3.1	1.5
Naphthalene		2	0.50	0.1040	0.02	0.03	0.02	4.5	5.1	4.8	0.08	0.11	0.10	7.8	10.6	9.2

Note: Calculated values shown have been rounded.

[a/] Analyte weathering rates in free-phase product calculated based on assumed initial analyte concentrations in fresh JP-4 fuel and one point in time free-phase product sample results.

[b/] Approximate age of spill as of the most recent sampling event.

[c/] Assumed initial concentrations from Smith et al., 1981.

[d/] wt% = weight percent.

[e/] k_0 = zero order rate constant or slope; units in weight percent per year.

[f/] Annual mass fraction reduction as a percent of the initial concentration; calculated using equation 5.4.

[g/] k_1 = first order rate constant or exponential decay rate; units in year^{-1} or 1/year.

[h/] Annual mass fraction reduction as a percent of the initial concentration; calculated using equation 5.8.

[i/] Result indicates a non-detect or near non-detect value; as appropriate, weathering rate calculations for this result were based off the method detection limit.

`--- = Negative value; measured concentration is greater than the assumed initial concentration.

gradients from the LNAPL plume to groundwater would be decreased. In this case, the decreased concentration gradients would slow contaminant migration from the LNAPL into groundwater.

Based on the mobile LNAPL sample results shown, the average zero-order BTEX and naphthalene weathering rates range from 2.0 to 21 %/yr, and 2.0 to 24 %/yr, respectively. The average first-order BTEX and naphthalene weathering rates range from 4.0 to 43 %/yr and 4.0 to 42 %/yr, respectively. The annual zero-order weathering rates are consistently lower than corresponding first-order rates. This negative variance between first-order and zero-order weathering rates is related to the underlying assumptions of the calculation methods, as discussed in Sections 2.3 and 5.2.2.

First-order weathering rates that were calculated using non-detect or near non-detect concentration values are significantly higher than reduction rates calculated for more moderate compound depletion. This was particularly evident at the McChord AFB site where virtually no BTEX or naphthalenes were detected in a single sample collected 24 years following the fuel release. For this site, first-order reduction rates were estimated at more than 40 %/yr. This occurrence highlights the limitation of using a single sample collected several years after the fuel release to estimate LNAPL weathering rates. Use of a 40 %/yr or similar weathering rate determined from non-detect or near non-detect concentrations would tend to overestimate contaminant source-term reductions for fate and transport modeling. (Note: When non-detect concentrations were observed during this study, weathering rates were calculated as if the compound was present at a concentration equal to the method detection limit.)

The McChord AFB data set also exemplifies the danger of using data from very old spills to determine weathering rates for a particular LNAPL plume. It is not known how long BTEX concentrations within the LNAPL plume at this site have been similar to or below the method detection limit. If the BTEX concentrations have been near or below the method detection limit for several years, then the calculated BTEX weathering rate does not accurately portray BTEX weathering at this site as there has effectively been no measurable weathering since BTEX concentrations were reduced to such low levels. Highly weathered LNAPL spills pose little to no risk to the groundwater, and calculation of weathering rates may only be an academic exercise.

As shown in Table 5.2, the range of average weathering rates were relatively broad for the BTEX and naphthalene compounds. If the high-biased first-order weathering rates at McChord AFB are excluded, the highest weathering rates were measured for Shaw AFB. At this site, the average zero-order total BTEX weathering rate was 15 %/yr, and average zero-order naphthalene/methylnaphthalene rates ranged from 17 to 21 %/yr. Average first-order weathering rates were higher (21 %/yr for BTEX and 25 to 30 %/yr for naphthalene and methylnaphthalenes). It is important to note that Shaw AFB is both the youngest LNAPL plume included in this study and the spill that has the most exact spill date. The lowest weathering rates were calculated for the Eaker AFB site (the oldest release), where the average total first-order and zero-order BTEX reduction rates were 2.4 %/yr and 4.4 %/yr, respectively. These observations indicate that weathering rates decrease with plume age, indicating that first order kinetics are more representative than zero-order kinetics for calculating LNAPL weathering rates.

The relatively low weathering rates observed at the Eaker site, and the relatively high weathering rates observed at the Shaw site, are also likely related to the soil types and groundwater flow velocities at each site. Groundwater at the Eaker site flows much more slowly than groundwater at the Shaw site, and the soils at Eaker are much finer-grained than at Shaw (Table 3.1). It is likely that the fine-grained soils and the slow groundwater flow rates at Eaker serve to retard contaminant mass migration from the LNAPL plume to groundwater and soil vapor. The result is relatively slow LNAPL component weathering rates at Eaker and relatively rapid LNAPL weathering rates at Shaw, where soil and groundwater conditions tend to promote contaminant mass migration out of the LNAPL plume. These observations indicate that LNAPL weathering rates will vary significantly from site to site, depending upon soil and groundwater conditions.

5.2.3.2 Combining JP-4 Site Data to Assess Weathering Rates

Very few fuel release sites have sufficient data available to determine the progression of mobile LNAPL BTEX depletion from the time of spill release until the time of complete BTEX removal (with the possible exception of the Shaw AFB site). However, comparing and compiling data from all JP-4 sites, regardless of differences in geologic or hydrogeologic effects, provides some insight into the relationship between BTEX depletion in mobile LNAPL and spill age. Figure 5.3 is a compilation of average total BTEX concentrations in mobile LNAPL from the six primary JP-4 sites. Similarly, Figure 5.4 represents a compilation of average benzene data from the six JP-4 sites.

Zero-order and first-order curves were fitted to the plotted data to evaluate BTEX and benzene weathering in mobile LNAPL with time. Considering the combined data from five of the six (excluding Eaker) JP-4 sites, the first-order curves appear to better match the general trend of the data. As shown on Figure 5.3, the zero-order curve greatly underestimates total BTEX depletion in the first eight years following a JP-4 release as indicated by the Shaw AFB site data (Table 5.2). The first-order curve better approximates the rapid depletion of BTEX initially observed at Shaw AFB, and also matches data collected from the Myrtle Beach and Charleston sites.

The benzene first-order curve shown on Figure 5.4 provides a reasonably good approximation of benzene weathering in mobile LNAPL at five of the six JP-4 sites (although the fit for data from Charleston AFB is mixed). As illustrated by Figures 5.3 and 5.4, the average Eaker AFB concentrations for total BTEX and benzene appear to better match that expected for a spill release that is between 5 and 10 years old for total BTEX and 5 to 8 years old for benzene, not 24 years old. The McChord data was excluded from the curve fits and associated calculations presented in Figures 5.3 and 5.4 because the majority of the compounds of interest were not detected at this highly weathered site.

Considering the total BTEX and benzene mobile LNAPL data for the JP-4 sites taken as a whole (except McChord), the first-order curves shown on Figures 5.3 and 5.4 provide potential default values for total BTEX and benzene weathering, respectively. Based on these results, it appears that a default first-order rate for total BTEX weathering from JP-4 mobile LNAPL could be assumed to be approximately 12 %/yr. For benzene weathering, a first-order weathering rate of approximately 19.5 %/yr is estimated considering all of the JP-4 site data.

FIGURE 5.3
TOTAL BTEX WEATHERING RATES CONSIDERING AVERAGE DATA FROM THE JP-4 RELEASE SITES
FUEL WEATHERING STUDY

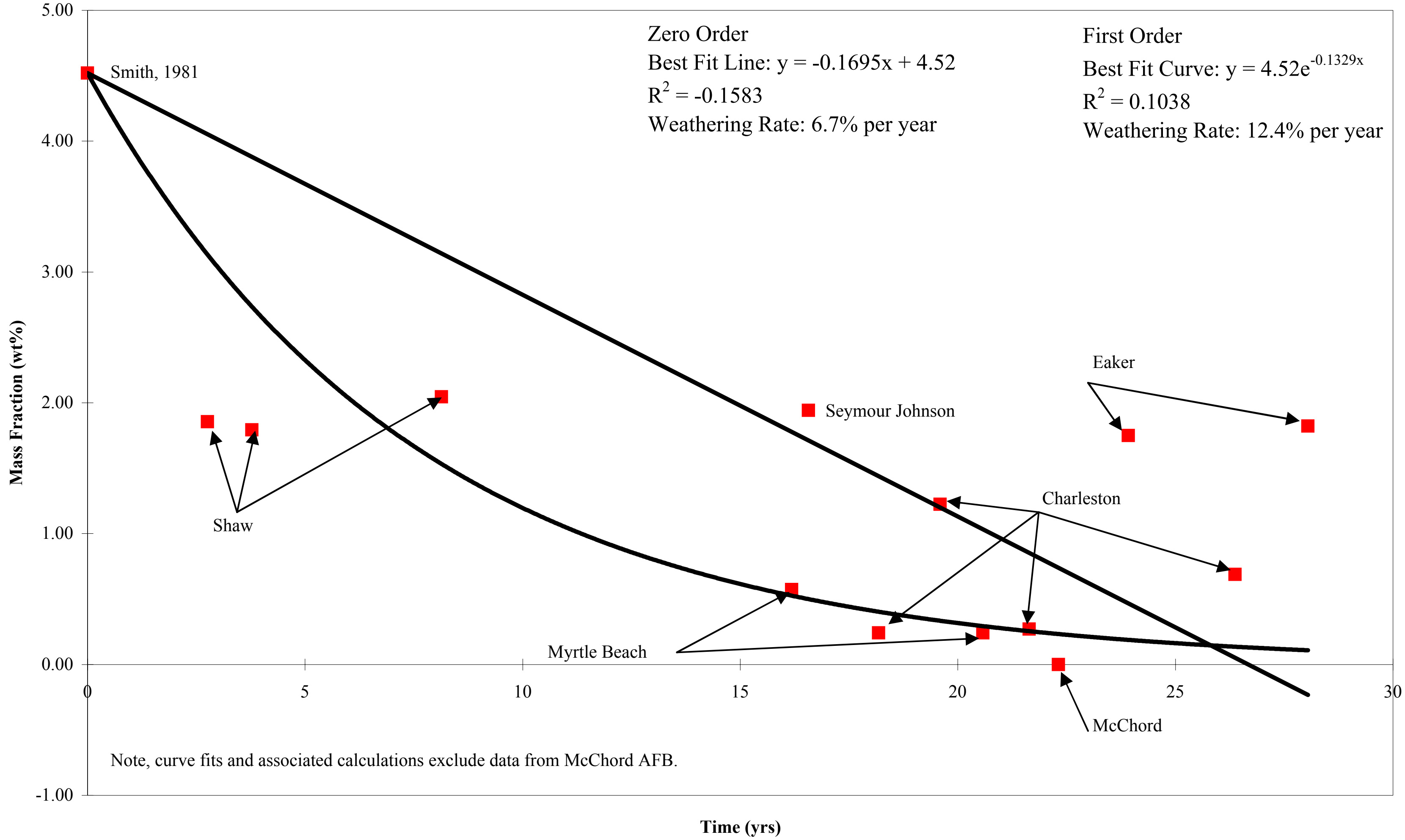
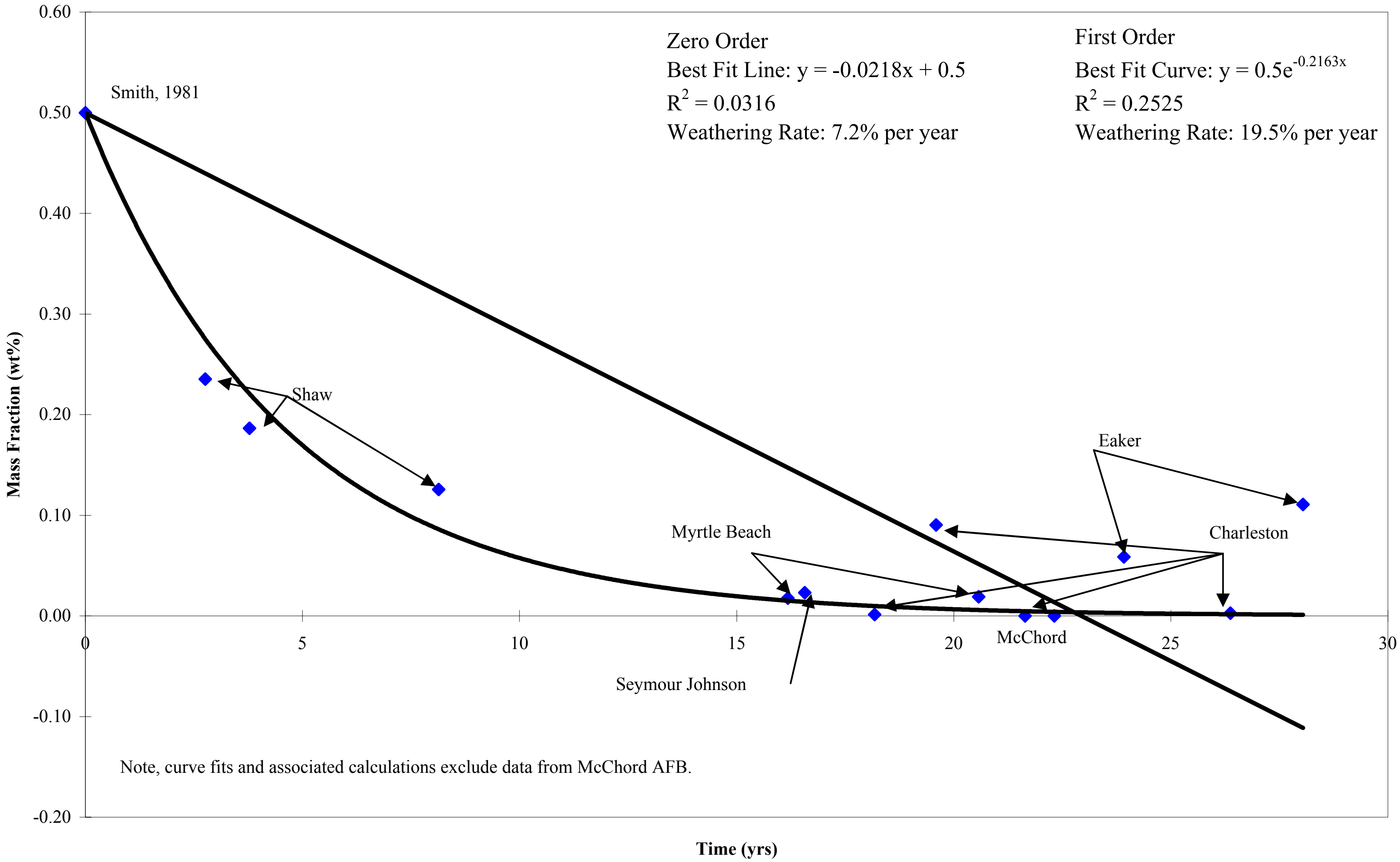


FIGURE 5.4
BENZENE WEATHERING CONSIDERING AVERAGE DATA FROM THE JP-4 RELEASE SITES
FUEL WEATHERING STUDY



5.2.3.3 Dissolution-Dominated Weathering

JP-4 site data suggest that BTEX mobile LNAPL weathering rates at the JP-4 sites is predominantly a function of dissolution. This is evidenced by comparing the relatively high weathering rates observed at Shaw and Myrtle Beach, where groundwater flow rates are relatively high, with the lower weathering rates observed at Eaker, where groundwater flow rates are relatively low. As discussed in Sections 2.3.1 and 2.3.2, dissolution and volatilization of LNAPL compounds are a function of their concentration in the mobile LNAPL as well as site-specific properties such as stratigraphy and groundwater flow rate. As concentrations in the mobile LNAPL decrease, the compound depletion rate decreases. This Raoult's Law behavior is apparent in the first-order weathering trend illustrated on Figures 5.3 and 5.4. Applied to this study, it appears that the decreased BTEX depletion rate with time is likely the result of decreasing BTEX dissolution flux to groundwater and/or decreasing BTEX volatilization flux to soil gas.

A comparison of compound specific weathering rates (Table 5.2) indicates that dissolution may be the predominant weathering mechanism acting to reduce chemical concentrations in mobile LNAPL. The most likely explanation for the different compound specific weathering rates observed is related to the solubilities of each of the compounds. Benzene and toluene are much more soluble in water than ethylbenzene and xylene. Thus benzene and toluene would be expected to weather at higher rates than ethylbenzene and xylene if the dominant weathering mechanism is dissolution into groundwater. The weathering rate data collected during this project indicates that benzene and toluene weathering rates are generally higher than ethylbenzene and xylene weathering rates, indicating that LNAPL weathering is dominated by dissolution into groundwater at most sites.

A comparison of BTEX weathering rates between the JP-4 sites also indicates that BTEX weathering may be dominated by dissolution. At the Eaker AFB site, the LNAPL plume is reported to be approximately 30 years old, while the LNAPL plume at the Shaw AFB site is reported to be only 9 years old. However, the total BTEX concentration in the source area at Eaker AFB (3.5 wt%) is much higher than the total BTEX concentration at the Shaw AFB site (1.94 wt%) despite the fact that the Eaker plume is much older than the Shaw plume. One likely explanation for the higher BTEX concentration and lower mobile LNAPL weathering rates at the Eaker AFB site is the significantly lower groundwater velocities and presence of fine-grained soils at Eaker. Under equilibrium conditions, lower groundwater velocities would create a lower dissolution flux for mobile LNAPL depletion (Section 2.4.2). As shown on Table 3.1, the Eaker AFB site has the lowest estimated groundwater velocity, 16 feet per year (ft/yr), of the four sites where groundwater velocity and mobile LNAPL data are available. Significantly higher groundwater velocities have been observed at Shaw AFB (400 ft/yr), Myrtle Beach AFB (420 ft/yr), Seymour Johnson (130 ft/yr) and Defense Fuel Supply Point (DFSP)-Charleston (62 ft/yr). These sites also have sandy soils and are located in areas having high precipitation. A combination of high groundwater velocities, sandy soils, and high precipitation/infiltration will enhance rates of dissolution and LNAPL weathering. No information was obtained regarding groundwater velocity for the McChord AFB site; however, high precipitation rates in the Seattle/Tacoma area

(Figure 3.1) are likely to enhance BTEX dissolution, much the same way as high groundwater velocity.

5.2.3.4 Weathering and Spill Age

As shown on Table 5.2, mobile LNAPL weathering rates for total BTEX generally decrease with increasing spill age. This is particularly evident comparing the average total BTEX reduction rates at the Shaw AFB, Myrtle Beach AFB, DFSP-Charleston, and Eaker AFB sites. For example, at Shaw AFB the average BTEX first-order weathering rates estimated at 2.8, 3.8, and 8.1 years after release were 27.9 %/yr, 23.6 %/yr, and 9.3 %/yr respectively (Table 5.2). A similar trend of decreasing weathering rates with spill age also was apparent for the naphthalene compounds.

The exceptions to this observation are BTEX component weathering rates calculated for the Charleston site. At Charleston, the calculated BTEX component weathering rates actually increase through the first three sampling events. These apparent exceptions are related to increasing BTEX component concentrations through time (Table 5.2), which in turn are most likely due to changes in groundwater flow characteristics. BTEX data from the Shaw AFB, Myrtle Beach AFB, and DFSP-Charleston sites all indicate that first-order benzene depletion rates in excess of 20 %/yr and first-order total BTEX depletion rates in excess of 12 %/yr occur during the first 20 years of mobile LNAPL weathering.

5.2.3.5 Site-Specific Weathering Based on Multiple Sampling Events

At the Shaw AFB and DFSP-Charleston sites, mobile LNAPL samples were collected from the same site monitoring wells during multiple sampling events. At the Shaw AFB site, mobile LNAPL samples were collected from site monitoring wells approximately 3 years, 4 years, and 8 years after the JP-4 release (Table 4.1). At the DFSP-Charleston site, mobile LNAPL samples were collected from site monitoring wells approximately 18 years, 20 years, 22 years, and 26 years following the fuel release. For these two sites, BTEX concentrations detected in mobile LNAPL samples collected during these sampling events were plotted together with the assumed initial BTEX concentrations in fresh JP-4 jet fuel (Smith *et al*., 1981). A simple best-fit regression analysis was then performed on the plotted data to determine zero-order and first-order weathering rate constants and BTEX reduction rates. These results are discussed in the following subsections.

5.2.3.5.1 Shaw AFB

The Shaw AFB site is the most "controlled" site that was evaluated based on its known spill date and certainty that additional spills have not occurred. BTEX weathering rates calculated from multiple sampling events at the Shaw AFB site assuming zero-order and first-order decay are presented on Figures 5.5 and 5.6, respectively. As shown on these figures, rate constants (k_0 and k_1) and annual reduction rates were determined using analytical results from NRMRL and OBG.

Figures 5.5 and 5.6 represent data collected from monitoring wells 1610-1, 1610-2, and 1610-3 at Shaw AFB. Data from monitoring well 1610-22 were not included because this well was only sampled during the 2002 sampling event. Calculations

FIGURE 5.5
ZERO-ORDER BTEX WEATHERING IN JP-4 LNAPL AT 1610-1, 2, AND 3
BUILDING 1610, SHAW AFB, SOUTH CAROLINA
FUEL WEATHERING STUDY

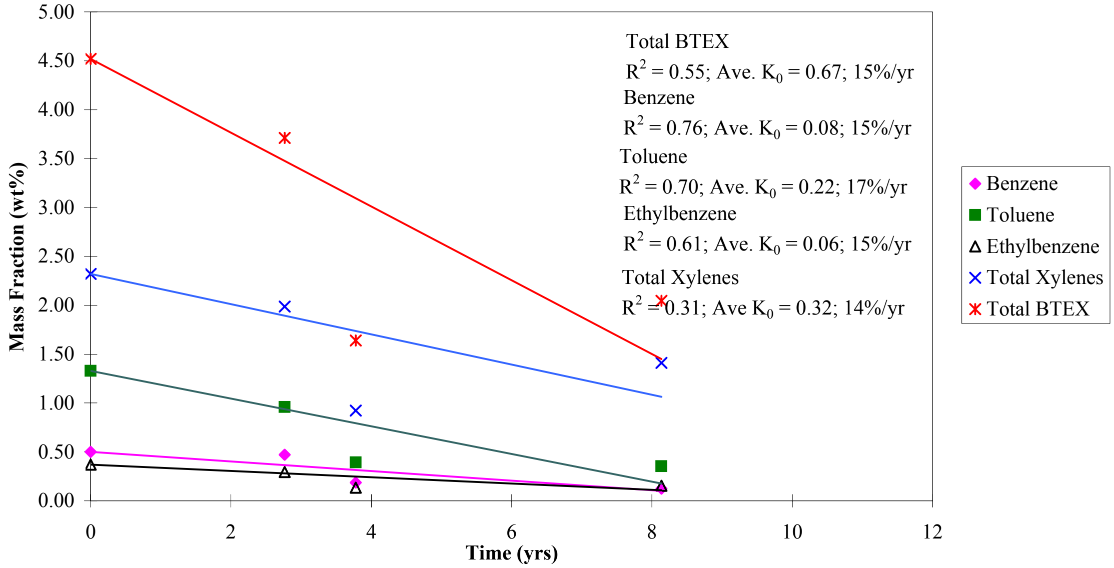
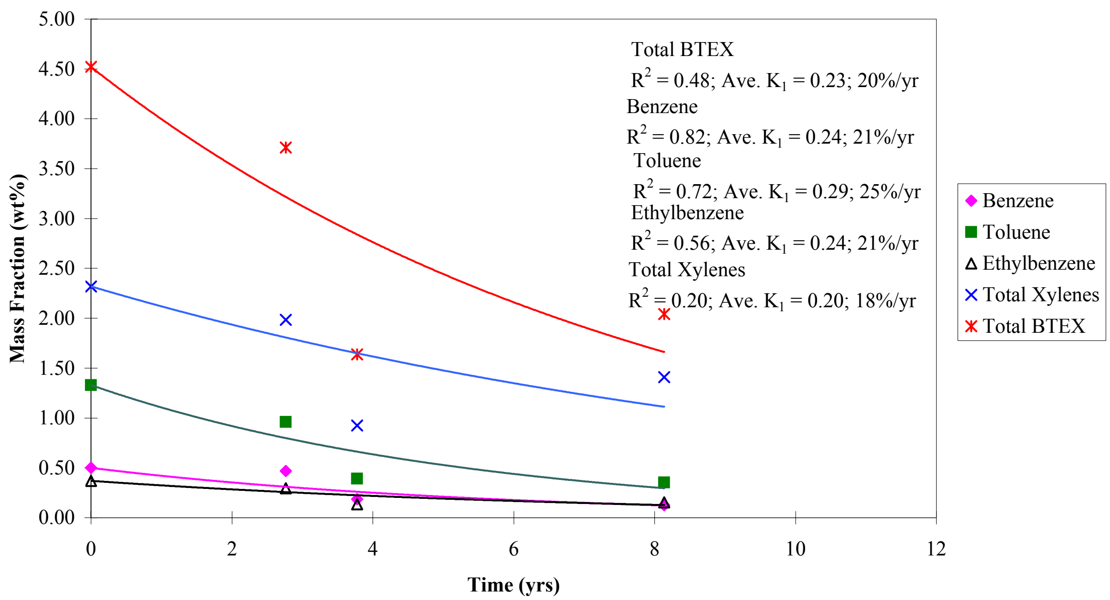


FIGURE 5.6
FIRST-ORDER BTEX WEATHERING IN JP-4 LNAPL AT 1610-1, 2, AND 3
BUILDING 1610, SHAW AFB, SOUTH CAROLINA
FUEL WEATHERING STUDY



presented on Figure 5.5 indicate that zero-order total BTEX reduction at the Shaw AFB site (calculated over the life of the plume) is occurring at approximately 15 %/yr. Calculations presented on Figure 5.6 indicate that first-order BTEX reduction is occurring at approximately 20 %/yr. Benzene, toluene, ethylbenzene, and total xylene first-order weathering rates are also significantly higher than the respective zero-order weathering rates (Figures 5.5, 5.6, and Table 5.2). At Shaw, calculated first-order weathering rates in mobile LNAPL appear to be highest for toluene at approximately 25 %/yr, while the calculated weathering rates for the remaining BTEX components and total BTEX are all approximately 18 %/yr to 21 %/yr.

Comparing Figures 5.5 and 5.6, the R^2 values for both the zero-order line fits and the first order curve fits are very similar. Thus, both the zero-order and first-order weathering rate assumptions appear to be equally valid for the limited data shown. Therefore, these data do not indicate whether zero-order or first-order weathering more accurately depicts BTEX depletion in mobile LNAPL at the Shaw AFB site. Nonetheless, the data plotted in Figures 5.5 and 5.6, and the calculated R^2 values, indicate that the initial BTEX concentration assumption (i.e., values determined by Smith *et al*. [1981]) for JP-4 is reasonable, and that total BTEX and BTEX component contaminant mass is weathering from the LNAPL plume at Shaw at 14 %/yr to 25 %/yr. However, the low magnitude of some of the coefficients of determination (R^2) (as low as 0.2), indicate a relatively high degree of variance between the data and the predictive trend line in some cases (total xylenes). In these cases, the degree to which the weathering rates derived from the best-fit curves are representative of actual conditions is somewhat speculative.

5.2.3.5.2 DFSP-Charleston

Zero-order and first-order BTEX weathering for the DFSP-Charleston site based on mobile LNAPL sample results are presented on Figures 5.7 and 5.8, respectively. Weathering rates shown on these two figures were determined using NRMRL and OBG analytical data obtained from monitoring well EW-6 only. The data set was limited to well EW-6 because this is the only well that was sampled during all four sampling events conducted at Charleston.

The zero- and first-order weathering rates calculated using data collected from multiple sampling events at Charleston (Figures 5.7 and 5.8) are generally significantly lower than the corresponding rates calculated for Shaw AFB (Figures 5.5 and 5.6). The lower magnitudes of the Charleston weathering rates are likely related to the ages of the two plumes. The Shaw plume is approximately 9 years old while the Charleston plume is approximately 28 years old. As discussed in Section 2.3.1, the Shaw plume would be expected to weather more rapidly because the BTEX concentrations in the Shaw LNAPL plume are relatively high, and the resulting concentration gradient between the LNAPL plume and the groundwater is relatively steep. The Charleston LNAPL plume would be expected to weather more slowly because the BTEX concentrations in this relatively old plume are relatively low. The lower concentration gradient between the LNAPL and the groundwater at Charleston contributes to a relatively low LNAPL weathering rate. The data presented on Figures 5.5 through 5.8 support this observation. Comparison of total BTEX weathering rates in samples collected from three wells at the DFSP-Charleston site indicates the degree to which these rates can vary spatially in a mobile LNAPL

FIGURE 5.7
ZERO-ORDER BTEX WEATHERING IN JP-4 LNAPL AT EW-6
TANK 1, DFSP-CHARLESTON, SOUTH CAROLINA
FUEL WEATHERING STUDY

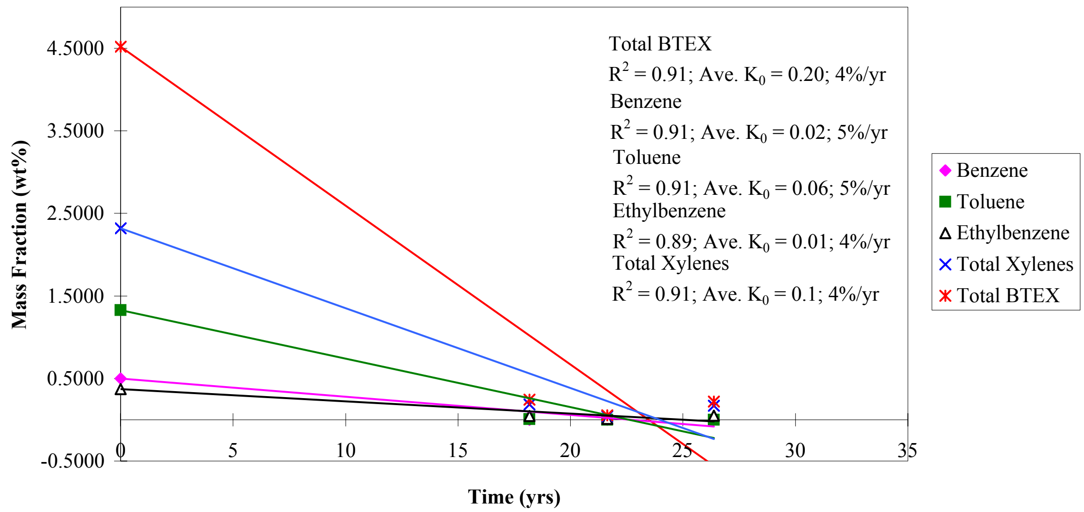
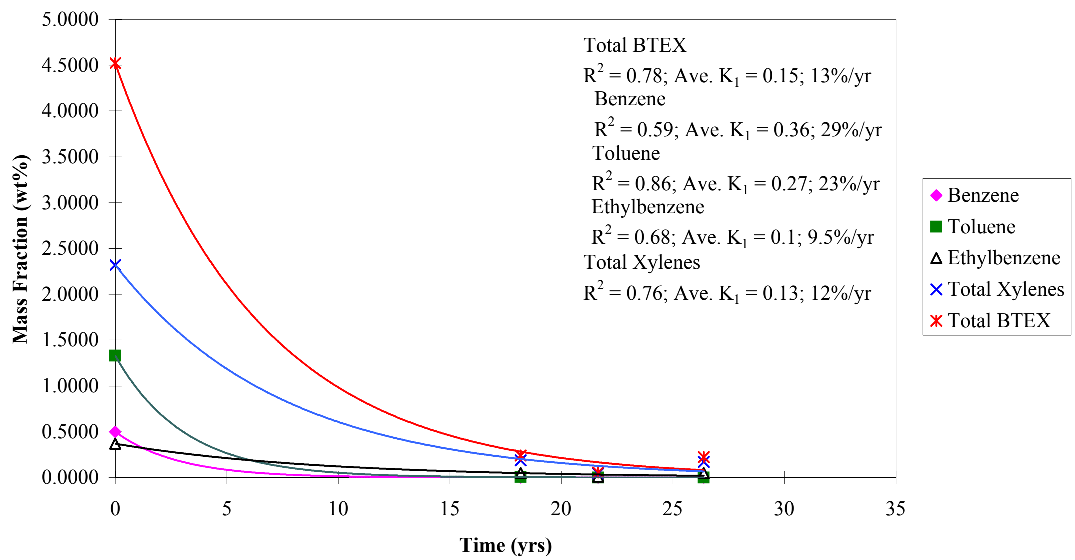


FIGURE 5.8
FIRST-ORDER BTEX WEATHERING IN JP-4 LNAPL AT EW-6
TANK 1, DFSP-CHARLESTON, SOUTH CAROLINA
FUEL WEATHERING STUDY



plume (Figure 5.9). Assuming first-order weathering, total BTEX reductions at the DFSP-Charleston site appear to range from 6 to 18 %/yr depending upon sample location. A review of the DFSP-Charleston site data did not provide any indication as to why the total BTEX weathering rates vary to this degree. Each of these monitoring wells is located downgradient from the original spill location and within approximately 70 feet of each other. Extraction well EW-6 does not appear to be located in a different hydrogeologic setting relative to monitoring wells MW-103 and WQ27B. However, visual observations of mobile LNAPL samples collected in May 1997 indicated that the mobile LNAPL from EW-6 was darker in color and likely more weathered than the sample collected from MW-103. These apparent differences in weathering rates within a single site underscores the importance of collecting several mobile LNAPL samples from each site so that an average weathering rate can be calculated.

5.2.4 Weathering in JP-5 Mobile LNAPL

Weathering rates for BTEX, naphthalene, and methylnaphthalene compounds were evaluated at two JP-5 release sites: Beaufort MCAS and Cecil Field NAS. One mobile LNAPL sampling event was performed at each site during May 1997. Cecil Field was sampled a second time in February 2002 as part of the fuel weathering study update. The approximate spill ages are 13 years for the Beaufort MCAS site and 22 years for the Cecil Field NAS site.

Assumed initial concentrations of BTEX, naphthalene, and methylnaphthalenes in fresh JP-5 were based on two data sets. For the Beaufort MCAS site, the initial mobile LNAPL concentrations were assumed to equal concentrations detected by NRMRL in a fresh JP-5 sample from Beaufort MCAS collected in 1997. For the Cecil Field NAS site, the initial mobile LNAPL concentrations were assumed to equal concentrations reported by Hughes *et al*. (1984) for fresh JP-5.

One-point BTEX, naphthalene, and methylnaphthalene weathering rates at the two JP-5 sites were evaluated using zero-order equations 5.3 and 5.7 and first-order equations 5.4 and 5.8. Calculation results are summarized in Table 5.3 and the following subsections.

5.2.4.1 Beaufort MCAS

At the Beaufort MCAS site, zero-order and first-order weathering rates were found to range between 4.1 %/yr and 8.2 %/yr and 4.7 %/yr and 12 %/yr, respectively, for the target compounds. Because the benzene concentrations detected in mobile LNAPL at the site were higher than the assumed initial concentration, no weathering rate constants or reduction rates could be determined for this compound. The estimated reduction rates for toluene, ethylbenzene, and xylenes indicate that these compounds are being depleted from JP-5 mobile LNAPL at approximately the same rate. As shown in Table 5.3, assumed initial concentrations and average remaining concentrations for xylenes are approximately two orders of magnitude higher than the toluene concentrations, and one order of magnitude higher than the ethylbenzene concentrations. Nonetheless, concentrations for each of these compounds are well below their respective concentrations in JP-4 (Figure 2.3). In view of these significantly lower fresh fuel and mobile LNAPL concentrations, groundwater MCLs for toluene, ethylbenzene, and

FIGURE 5.9
COMPARISON OF FIRST-ORDER TOTAL BTEX WEATHERING AT FOUR WELLS
DFSP-CHARLESTON, SOUTH CAROLINA
FUEL WEATHERING STUDY

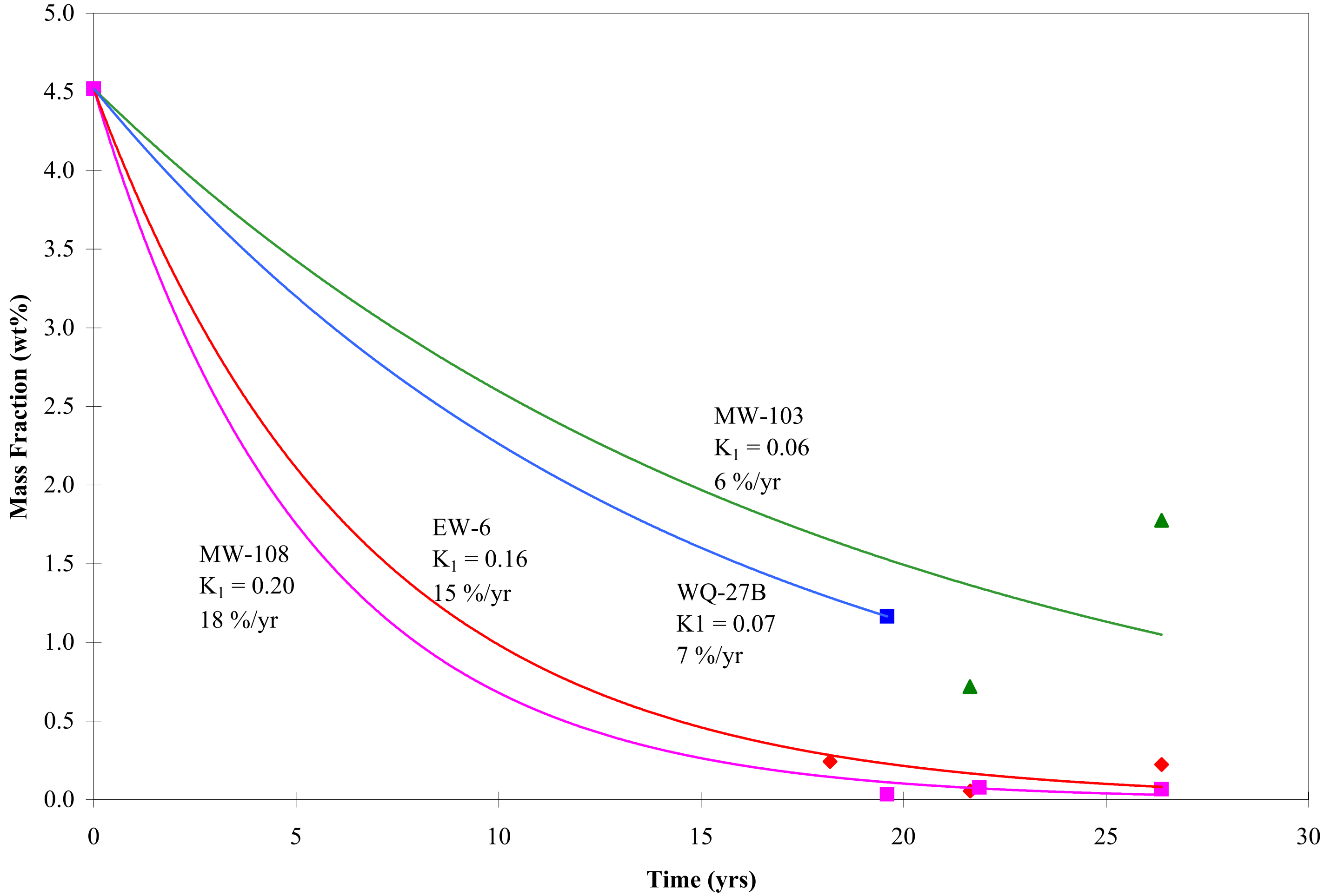


TABLE 5.3

FUEL RELATED COMPOUND (ONE POINT)[a/] WEATHERING RATES IN JP-5 MOBILE LNAPL

FUEL WEATHERING STUDY

Site / Analyte	Approximate Spill Age[b/] (years)	Number of Samples	Assumed Initial Conc. (C_o)[c/] (wt%)[d/]	Average Remaining Conc.(C) (wt%)	ZERO-ORDER Rate Constant k_0[e/]	ZERO-ORDER % Reduction/Year[f/]	FIRST-ORDER Rate Constant k_1[g/]	FIRST-ORDER % Reduction/Year[h/]
Beaufort MCAS, SC	**7.2**							
Benzene		1	0.000	0.000	---[i/]	---	---	---
Toluene		1	0.005	0.002	0.00	9.1	0.147	13.7
Ethylbenzene		1	0.042	0.014	0.00	9.1	0.148	13.8
Total Xylenes		1	0.239	0.076	0.02	9.5	0.159	14.7
Total BTEX		1	0.286	0.092	0.03	**9.4**	0.157	**14.5**
Naphthalene		1	0.120	0.057	0.01	7.4	0.105	9.9
1- Methylnaphthalene		1	0.227	0.160	0.01	4.1	0.048	4.7
2- Methylnaphthalene		1	0.295	0.186	0.02	5.1	0.064	6.2
Total Naphthalenes		1	0.642	0.403	0.03	5.2	0.065	6.2
Cecil Field NAS, FL	**16.0**							
Benzene		1	0.000	0.003	0.00	---	---	---
Toluene		1	0.000	0.015	0.00	---	---	---
Ethylbenzene		1	0.000	0.315	-0.02	---	---	---
Total Xylenes		1	0.020	0.599	-0.04	---	---	---
Total BTEX		1	0.020	0.933	-0.06	---	---	---
Naphthalene		1	0.886	0.235	0.04	4.6	0.083	8.0
1- Methylnaphthalene		1	0.266	0.287	0.00	---	---	---
2- Methylnaphthalene		1	0.452	0.416	0.00	0.5	0.005	0.5
Total Naphthalenes		1	1.605	0.937	0.04	2.6	0.034	3.3
Cecil Field NAS, FL	**20.7**							
Benzene		1	0.000	0.005	---	---	---	---
Toluene		1	0.000	0.005	---	---	---	---
Ethylbenzene		1	0.000	0.012	---	---	---	---
Total Xylenes		1	0.020	0.100	---	---	---	---
Total BTEX		1	0.020	0.122	---	---	---	---
Naphthalene		1	0.886	0.074	0.019	3.3	0.0554	5.4

Note: Calculated values shown have been rounded.

[a/] Analyte weathering rates in free-phase product calculated based on an assumed initial concentration in fresh JP-5 jet fuel and free-phase product sample results measured at a single point in time.

[b/] Approximate age of the spill as of the most recent sampling event.

[c/] For Beaufort MCAS results, the assumed initial concentration of analytes is equal to the NRMRL concentration for a fresh JP-5 sample collected from Beaufort MCAS in May 1997. For Cecil Field Results, Hughes et al. (1984) JP-5 composition values were used.

[d/] wt% = weight percent.

[e/] k_0 = zero order rate constant or slope; units in weight percent per year.

[f/] Annual mass fraction reduction as a percent of the initial concentration; calculated using equation 5.4.

[g/] k_1 = first order rate constant or exponential decay rate; units in $years^{-1}$ or 1/years.

[h/] Annual mass fraction reduction as a percent of the initial concentration; calculated using equation 5.8.

`--- = Negative value; measured concentration is greater than the assumed initial concentration.

xylenes are unlikely to be exceeded by partitioning of these compounds from the fuel into site groundwater (Section 5.1.2).

BTEX, naphthalene, and methylnaphthalene weathering rates at the Beaufort Tank Farm C site generally fall within the same range as the JP-4 rates for these compounds shown in Table 5.2. A rough interpolation of the average JP-4 reduction rates shown in Table 5.2 for Shaw AFB (a 4-year-old spill) and Myrtle Beach AFB (a 16-year-old spill) would give rates comparable to those determined for JP-5 at the Beaufort Tank Farm C site (a 7-year-old spill).

5.2.4.2 Cecil Field NAS

spAt the Cecil Field NAS site, weathering rates could be estimated only for naphthalene and 2-methylnaphthalene. Measured mobile LNAPL concentrations for all other analytes exceeded the assumed initial values. Relative to the naphthalene and 2-methylnaphthalene rates computed for the Beaufort MCAS site, estimated reduction rates at the Cecil Field NAS site are substantially lower.

5.2.5 Weathering in JP-8 Mobile LNAPL

Weathering rates for BTEX, naphthalene, and methylnaphthalene compounds were evaluated at two JP-8 release sites: Pope AFB and Seymour Johnson AFB, Building 4522. One mobile LNAPL sampling event was performed at the Pope AFB site in July 1996, approximately 3 months after the fuel release. Three mobile LNAPL sampling events were performed at the Seymour Johnson AFB site in the first 2.3 years following the fuel release.

5.2.5.1 Pope AFB

Approximately 3 months after the JP-8 release at Pope AFB, the US Army Corps of Engineers (USACE) collected one mobile LNAPL sample for analysis by the NRMRL. No benzene or toluene were detected in the mobile LNAPL sample, and ethylbenzene and xylenes concentrations were approximately 90 percent lower than the assumed initial concentrations. Zero-order and first-order reduction rates were calculated based on this single sample result; however, the very low to non-detectable concentrations of BTEX in the sample prevented meaningful determination of LNAPL weathering rates. Compared to the other fuel release sites, a relatively small volume (700 gallons) of fuel was released at the Pope AFB site (Table 3.1), and no free-phase product was evident at the site approximately 6 months after the fuel release (Dalzell, 1997). It appears that significant volatilization may have rapidly reduced the BTEX fraction in this small spill.

5.2.5.2 Seymour Johnson AFB

One-point weathering rates determined for the Seymour Johnson AFB site are presented in Table 5.4. Weathering rates presented in this table are based on six samples collected over approximately 6 years from three monitoring wells. As with the JP-4 data shown in Table 5.2, the estimated weathering rates calculated from the Seymour Johnson AFB samples vary significantly. The average reduction rates suggest that weathering is slowest for ethylbenzene, most likely as a result of its lower effective water solubility

TABLE 5.4
FUEL COMPONENT (ONE POINT)[a/] WEATHERING RATES IN JP-8 MOBILE LNAPL
FUEL WEATHERING STUDY

Site Analyte	Approximate Spill Age[b/] (years)	Number of Samples	Assumed Initial Conc. (C_o)[c/] (wt%)[d/]	Average Remaining Conc. (C) (wt%)	ZERO-ORDER Rate Constant k_0[e/] min	max	avg	ZERO-ORDER % Reduction/Year[f/] min	max	avg	FIRST-ORDER Rate Constant k_1[g/] min	max	avg	FIRST-ORDER % Reduction/Year[h/] min	max	avg
Seymour Johnson AFB, NC	**0.6**															
Benzene		1	0.03	0.031			0.00			**6**			0.06			**6**
Toluene		1	0.21	0.206			0.00			2			0.02			2
Ethylbenzene		1	0.15	0.156			---			---			---			---
Total Xylenes		1	1.13	0.949			0.30			26			0.29			25
Total BTEX		1	1.52	1.342			0.29			**19**			0.21			**19**
Naphthalene		1	0.25													
1- Methylnaphthalene		1	0.43													
2- Methylnaphthalene		1	0.35													
Total Naphthalenes		1	1.04													
Seymour Johnson AFB, NC	**1.5**															
Benzene		2	0.03	0.025	0.01	0.01	0.01	16.2	16.4	**16**	0.19	0.19	0.19	16.9	17.1	**17**
Toluene		2	0.21	0.131	0.05	0.05	0.05	24.8	25.9	25	0.31	0.32	0.32	26.5	27.1	27
Ethylbenzene		2	0.15	0.149	0.00	0.00	0.00	0.6	1.7	1	0.01	0.02	0.01	0.6	1.7	1
Total Xylenes		2	1.13	0.769	0.24	0.26	0.25	21.2	22.8	22	0.25	0.28	0.27	22.4	24.2	23
Total BTEX		2	1.52	1.073	0.30	0.32	0.31	19.6	21.0	**20**	0.23	0.25	0.24	20.6	22.2	**21**
Naphthalene		2	0.25	0.349	0.06	0.06	0.06	23.8	25.2	24	0.29	0.31	0.30	25.3	26.9	26
1- Methylnaphthalene		2	0.43	0.717	0.16	0.16	0.16	37.8	38.1	38	0.55	0.56	0.55	42.2	42.6	42
2- Methylnaphthalene		2	0.35	0.270	0.04	0.05	0.04	10.7	12.8	12	0.12	0.14	0.13	10.9	13.2	12
Total Naphthalenes		2	1.04	0.164	0.26	0.27	0.27	25.1	26.3	26	0.31	0.33	0.32	26.8	28.2	27
Seymour Johnson AFB, NC	**2.3**															
Benzene		2	0.03	0.015	0.01	0.01	0.01	35.7	36.1	**36**	0.74	0.76	0.75	52.1	53.0	**53**
Toluene		2	0.21	0.104	0.06	0.06	0.06	27.4	28.4	28	0.43	0.46	0.44	34.9	36.7	36
Ethylbenzene		2	0.15	0.126	0.02	0.02	0.02	13.5	15.5	15	0.16	0.19	0.18	14.9	17.4	16
Total Xylenes		2	1.13	0.575	0.32	0.33	0.17	28.6	29.5	29	0.46	0.49	0.48	37.0	38.7	38
Total BTEX		2	1.52	0.821	0.41	0.43	0.24	27.1	28.1	**28**	0.42	0.45	0.43	34.3	36.2	**35**
Naphthalene		2	0.25	0.315	0.06	0.07	0.07	25.3	26.2	26	0.38	0.40	0.39	31.4	32.8	32
1- Methylnaphthalene		2	0.43	0.622	0.12	0.58	0.35	27.6	39.4	34	0.44	0.99	0.71	35.3	63.0	49
2- Methylnaphthalene		2	0.35	0.203	0.05	0.13	0.09	15.0	24.6	20	0.18	0.36	0.27	16.7	30.3	24
Total Naphthalenes		2	1.04	0.135	---	---	---	---	---	---	---	---	---	---	---	---

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TABLE 5.4 (Continued)
FUEL COMPONENT (ONE POINT)[a/] WEATHERING RATES IN JP-8 MOBILE LNAPL
FUEL WEATHERING STUDY

Site / Analyte	Approximate Spill Age[b/] (years)	Number of Samples	Assumed Initial Conc. (C_o)[c/] (wt%)[d/]	Average Remaining Conc. (C) (wt%)	ZERO-ORDER: Rate Constant k_0 [e/] min	ZERO-ORDER: Rate Constant k_0 [e/] max	ZERO-ORDER: Rate Constant k_0 [e/] avg	ZERO-ORDER: % Reduction/Year [f/] min	ZERO-ORDER: % Reduction/Year [f/] max	ZERO-ORDER: % Reduction/Year [f/] avg	FIRST-ORDER: Rate Constant k_1 [g/] min	FIRST-ORDER: Rate Constant k_1 [g/] max	FIRST-ORDER: Rate Constant k_1 [g/] avg	FIRST-ORDER: % Reduction/Year [h/] min	FIRST-ORDER: % Reduction/Year [h/] max	FIRST-ORDER: % Reduction/Year [h/] avg
Seymour Johnson AFB, NC	**5.6**															
Benzene		1	0.03	0.048			---			**---**			---			---
Toluene		1	0.21	0.047			0.03			14			0.26			23
Ethylbenzene		1	0.15	0.150			0.00			0			0.00			0
Total Xylenes		1	1.13	0.570			0.10			9			0.12			11
Total BTEX		1	1.52	0.815			0.13			**8**			0.11			**10**
Naphthalene		1	0.25	0.120			0.02			9			0.13			12
1- Methylnaphthalene		1	0.43													
2- Methylnaphthalene		1	0.35													
Total Naphthalenes		1	1.04													

Note: Calculated values shown have been rounded.

[a/] Analyte weathering rates in free-phase product calculated based on assumed initial analyte concentration in fresh JP-8 fuel and free-phase product sample results collected at one point in time.

[b/] Approximate age of spill as of the most recent sampling event.

[c/] Assumed initial concentrations from Mayfield, 1996.

[d/] wt% = weight percent.

[e/] k_0 = zero order rate constant or slope; units in weight percent per year.

[f/] Annual mass fraction reduction as a percent of the initial concentration; calculated using equation 5.4.

[g/] k_1 = first order rate constant or exponential decay rate; units in year^{-1} or 1/year.

[h/] Annual mass fraction reduction as a percent of the initial concentration; calculated using equation 5.8.

[i/] Result indicates a non-detect or near non-detect value; as appropriate, weathering rate calculations for this result were based off the method detection limit.

`--- = Negative value; measured concentration is greater than the assumed initial concentration.

(effective water solubility values for JP-8 were not identified in the literature; however, the relative effective water solubility values for the BTEX compounds are expected to be very similar to those shown in Table 2.1 for JP-4 and gasoline). The single-point calculations presented in Table 5.4 indicate that zero-order benzene and total BTEX weathering rates ranged from 6 %/yr to 36 %/yr and 8 %/yr to 28 %/yr, respectively. The first-order weathering rates calculated for benzene and total BTEX ranged from 6 %/yr to 53 %/yr and 10 %/yr to 35 %/yr, respectively. The average single-point first-order weathering rate for benzene and total BTEX was approximately 25 %/yr and 21 %/yr, respectively. This average weathering rate is very similar to average first-order benzene (21 %/yr) and total BTEX (20 %/yr) weathering rates computed for Shaw AFB (Table 5.2). This similarity indicates that the two releases, which are both approximately the same age, are weathering at approximately the same rate.

The LNAPL plume at Shaw might be expected to weather faster than the LNAPL plume at Seymour Johnson because the Shaw plume consists of JP-4, which has a much higher initial concentration of BTEX components than JP-8 (Section 2.1.2). In addition, the higher groundwater flow rate at Shaw relative to the rate at Seymour Johnson (Table 3.1) would also be expected to result in more-rapid LNAPL weathering at Shaw, as discussed in Section 2.3.1. One possible explanation for the observed weathering rates at these sites is that the water table at Seymour Johnson is much shallower than at Shaw. The combination of a shallow water table and sandy soils would be expected to result in increased weathering rates as both infiltration of precipitation and soil vapor exchange with atmospheric air would be increased. Thus, LNAPL weathering rates at Seymour Johnson may result from significant volatilization and recharge-related dissolution.

Mobile LNAPL sample results from the multiple sampling events at Seymour Johnson AFB, as well as zero-order and first-order best-fit curves, are shown on Figures 5.10 and 5.11, respectively. The calculated zero-order and first-order weathering rates depicted on Figures 5.10 and 5.11 are similar on a compound-specific basis. The first-order, multi-point weathering rates for benzene and total BTEX were both approximately 25 %/yr, while the zero-order weathering rates for benzene and total BTEX were 19 %/yr and 22 %/yr, respectively. No conclusions can be reached regarding whether zero-order or first-order weathering more accurately depicts BTEX depletion in mobile LNAPL at the Shaw AFB site, as the R^2 values for both zero-order and first-order fits are very similar. Nonetheless, the data plotted on Figures 5.10 and 5.11, and the calculated R^2 values, indicate that the initial BTEX concentration assumptions (i.e., values determined by Mayfield [1996]) for JP-8 are reasonable, and that total BTEX and BTEX component contaminant mass is weathering from the LNAPL plume at Seymour Johnson at 8%/yr to 32 %/yr. For the weathering rate curves shown on Figures 5.10 and 5.11, coefficient of determination (R^2) values ranged from 0.57 to 0.97, indicating varying degrees of "goodness of fit" for the trend lines (see Appendix C).

5.2.6 Weathering in Gasoline Mobile LNAPL

BTEX weathering in gasoline mobile LNAPL was evaluated at the Offutt AFB site. Compared to the other fuel weathering sites, where the dates of the fuel releases are known with some confidence, mobile LNAPL at the Offutt AFB site most likely is the result of chronic, long-term leakage from former USTs which ended in 1990 when the

FIGURE 5.10
ZERO-ORDER BTEX WEATHERING IN JP-8 MOBILE LNAPL AT MW-1S
BUILDING 4522, SEYMOUR JOHNSON AFB, NORTH CAROLINA
FUEL WEATHERING STUDY

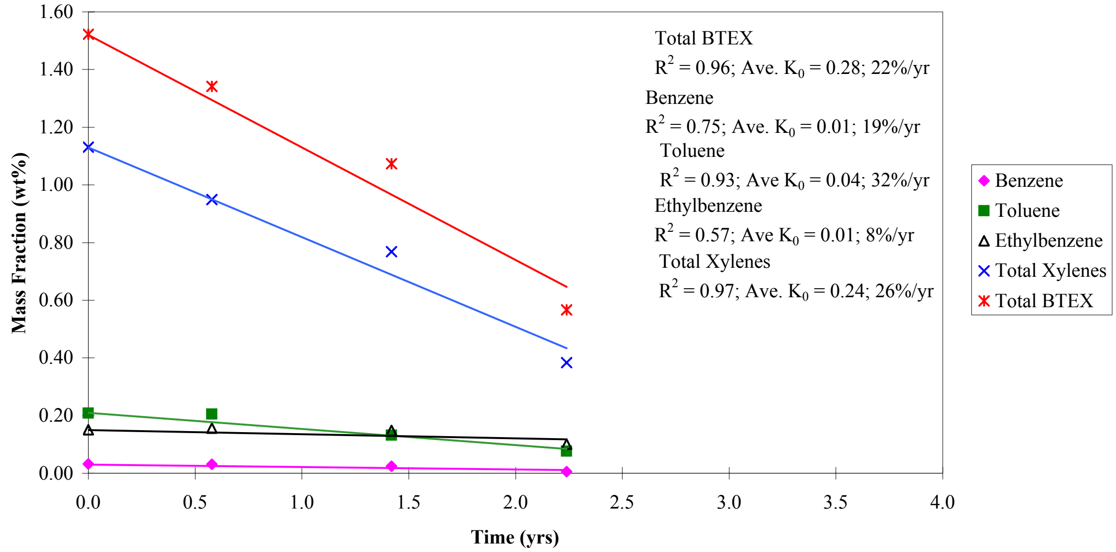
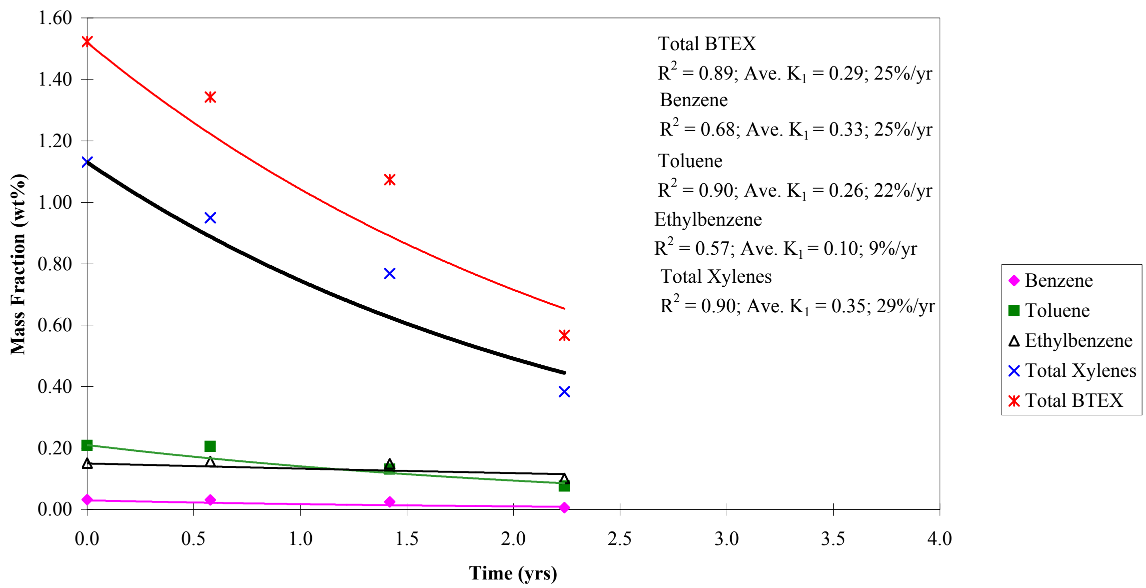


FIGURE 5.11
FIRST-ORDER BTEX WEATHERING IN JP-8 MOBILE LNAPL AT MW-1S
BUILDING 4522, SEYMOUR JOHNSON AFB, NORTH CAROLINA
FUEL WEATHERING STUDY



gasoline tanks were closed. The Offutt AFB site was selected for inclusion in the study because of the existence of historical BTEX analytical results for mobile LNAPL.

5.2.6.1 One-Point Weathering Rates

Fuel component one-point weathering rates for the Offutt AFB site are presented in Table 5.5. Rates provided in this table were calculated from BTEX analytical results for each of four LNAPL sampling events conducted following closure of the source USTs. Initial BTEX concentrations were assumed to be equal to those determined by Ghassemi *et al*. (1984) for fresh gasoline. Single point weathering rates calculated for the first sample collection round are calculated using starting concentrations from Ghassemi *et al*. (1984) (Figure 2.3). Single-point weathering rate calculations for subsequent sampling rounds assume that the starting concentrations are equal to the concentrations detected in each well during the previous round, and rates are calculated over the time interval between rounds. Initial evaluation of the site weathering rates indicated significant variability by sampling location; therefore, one-point weathering rates are presented in Table 5.5 for each sampled monitoring well.

Comparison of the mobile LNAPL sample results with the assumed initial concentrations in fresh gasoline indicates that the mobile LNAPL at the Offutt AFB site is only slightly weathered. The most significant BTEX reductions in mobile LNAPL were observed in the sample collected from MW349-8 approximately 6 years after tank closure. At this location, more than 90 percent of the benzene was depleted from the mobile LNAPL, and the total BTEX concentration was reduced by approximately 50 percent. Higher weathering rates (i.e., lower analyte concentrations) at MW349-7 and MW349-8 relative to MW349-1 may be the result of their locations further from the original source area. Mobile LNAPL at MW349-7 and MW349-8 is likely to be older than that at MW349-1. In all cases, benzene and toluene appear to have weathered at faster rates than xylenes and ethylbenzene. Assuming that the initial concentrations reported by Ghassemi *et al*. (1984) are representative of this site, little to no reduction in ethylbenzene concentrations has occurred in mobile LNAPL at the site. Relatively low groundwater velocities and resulting lower dissolution potential at the Offutt AFB site may be a primary reason for the lower BTEX weathering rates (Table 3.1). In many cases, weathering rates for this site could not be calculated because detected concentrations exceeded assumed initial concentrations. These apparent increases in contaminant concentrations (e.g., MW349-8) may indicate that groundwater flow patterns have changed such that "fresher" LNAPL has moved into the MW349-8 area. Alternatively, the low ethylbenzene weathering rates observed at Offutt may indicate that the initial concentrations reported by Ghassemi *et al*. (1984) are not representative of this site.

Single-point, zero-order benzene and total BTEX weathering rates calculated from data collected at Offutt AFB averaged 8 %/yr and 3 %/yr, respectively. Single-point, first-order benzene and total BTEX weathering rates averaged 12 %/yr and 3.4 %/yr respectively. BTEX components in gasoline LNAPL would be expected to weather at higher rates than BTEX components in jet fuel (Section 2.3). However, LNAPL variability at this site makes it impossible to generate a single set of representative weathering rates.

TABLE 5.5

FUEL COMPONENT (ONE POINT)[a] WEATHERING RATES IN GASOLINE MOBILE LNAPL

FUEL WEATHERING STUDY

Site / Analyte	Approximate Spill Age (years)[b]	Time between events (years)	Initial Conc. (C_o)[c] (wt%)[d]			Remaining Conc. (C) (wt %)			ZERO ORDER						FIRST ORDER					
									Rate Constant k_0[e]			% Reduced/Year[f]			Rate Constant k_1[g]			% Reduction/Year[h]		
<u>Offutt AFB, NE</u>	**4.5**	**4.5**	MW349-1	MW349-7		MW349-1	MW349-7		MW349-1	MW349-7		MW349-1	MW349-7		MW349-1	MW349-7		MW349-1	MW349-7	
Benzene			1.50	1.50		1.12	0.76		0.085	0.165		**5.65**	**11.02**		0.065	0.152		**6.30**	**14.07**	
Toluene			5.90	5.90		5.57	3.88		0.074	0.453		1.26	7.67		0.013	0.094		1.29	8.97	
Ethylbenzene			1.30	1.30		1.40	1.26		---	0.010		---	0.75		---	0.008		---	0.76	
Total Xylenes			5.90	5.90		5.70	5.69		0.044	0.048		0.75	0.81		0.008	0.008		0.76	0.82	
Total BTEX			14.60	14.60		13.79	11.59		0.182	0.675		**1.25**	**4.63**		0.013	0.052		**1.27**	**5.05**	
Naphthalene			0.44	0.44		0.25	0.29		0.042	0.146		9.65	7.42		0.126	0.090		11.85	8.61	
<u>Offutt AFB, NE</u>	**6.1**	**1.6**	MW349-1	MW349-8		MW349-1	MW349-8		MW349-1	MW349-8		MW349-1	MW349-8		MW349-1	MW349-8		MW349-1	MW349-8	
Benzene			1.12	1.50		1.16	0.13		---	0.226		---	**15.05**		---	0.404		---	**33.26**	
Toluene			5.57	5.90		5.03	1.66		0.541	0.698		6.03	11.84		0.063	0.209		6.14	18.86	
Ethylbenzene			1.40	1.30		1.57	1.36		---	---		---	---		---	---		---	---	
Total Xylenes			5.70	5.90		5.22	4.39		0.486	0.248		**5.29**	**4.21**		0.055	0.049		**5.38**	**4.75**	
Total BTEX			13.79	14.60		12.98	7.54		0.808	1.163		3.63	7.96		0.037	0.109		3.67	10.31	
<u>Offutt AFB, NE</u>	**7.1**	**1.0**	MW349-1	MW349-6		MW349-1	MW349-6		MW349-1	MW349-6		MW349-1	MW349-6		MW349-1	MW349-6		MW349-1	MW349-6	
Benzene			1.16	1.50		1.15	1.31		0.009	0.027		**0.76**	**1.80**		0.008	0.019		**0.76**	**1.91**	
Toluene			5.03	5.90		5.56	5.62		---	0.039		---	0.66		---	0.007		---	0.68	
Ethylbenzene			1.57	1.30		1.54	1.84		0.033	---		2.11	---		0.021	---		2.11	---	
Total Xylenes			5.22	5.90		5.96	6.05		---	---		---	---		---	---		---	---	
Total BTEX			12.98	14.60		14.22	14.83		---	---		---	---		---	---		---	---	
1,2,3-Trimethylbenzene						0.48	0.54		---	---		---	---		---	---		---	---	
1,2,4-Trimethylbenzene						2.06	2.17		---	---		---	---		---	---		---	---	
1,3,5-Trimethylbenzene						0.60	0.63		---	---		---	---		---	---		---	---	
Naphthalene				0.44		0.30	0.29		---	0.021		---	4.89		---	0.060		---	5.82	
<u>Offutt AFB, NE</u>	**11.6**	**4.5**	MW349-1	MW349-6	MW349-8	MW349-1	MW349-6	MW349-8	MW349-1	MW349-6	MW349-8	MW349-1	MW349-6	MW349-8	MW349-1	MW349-6	MW349-8	MW349-1	MW349-6	MW349-8
Benzene			1.15	1.50	0.13	0.58	0.6000	0.16	0.126	0.140	---	**10.89**	**10.7**	---	0.151	0.154	---	**13.98**	**14.3**	---
Toluene			5.56	5.90	1.66	5.80	4.9000	2.5	---	0.143	---	---	2.5	---	---	0.027	---	---	2.7	---
Ethylbenzene			1.54	1.30	1.36	1.70	1.8000	1.7	---	0.008	---	---	0.5	---	---	0.005	---	---	0.5	---
Total Xylenes			5.96	5.90	4.39	8.30	7.2000	7.6	---	---	---	---	---	---	---	---	---	---	---	---
Total BTEX			14.22	14.60	7.54	16.38	14.5000	11.96	---	0.065	---	---	**0.4**	---	---	0.004	---	---	**0.4**	---
1,2,3-Trimethylbenzene			0.48	14.60		0.65	0.5800	0.77	---	---	---	---	---	---	---	---	---	---	---	---
1,2,4-Trimethylbenzene			2.06	14.60		2.80	2.9000	3.1	---	---	---	---	---	---	---	---	---	---	---	---
1,3,5-Trimethylbenzene			0.60	14.60		0.73	0.6100	0.87	---	0.004	---	---	0.7	---	---	0.007	---	---	0.7	---
Naphthalene			0.30	14.60		0.37	0.1800	0.87	---	0.021	---	---	7.4	---	---	0.093	---	---	8.9	---
		zero order	first order																	
Average Benzene Weathering Rate		**7.98**	**12.1**																	
Average Total BTEX Weathering Rate		**3.16**	**3.4**																	

Note: Calculated values shown have been rounded.

[a] Analyte weathering rates in free-phase product calculated based on assumed initial analyte concentrations in fresh JP-4 fuel and free-phase product sample results measured at one point in time.

[b] Approximate age of spill as of the most recent sampling event.

[c] Assumed initial concentrations from Smith et al., 1981.

[d] wt% = weight percent.

[e] k_0 = zero order rate constant or slope; units in weight percent per year.

[f] Annual mass fraction reduction as a percent of the initial concentration; calculated using equation 5.4.

[g] k_1 = first order rate constant or exponential decay rate; units in year^{1} or 1/year.

[h] Annual mass fraction reduction as a percent of the initial concentration; calculated using equation 5.8.

[i] Result indicates a non-detect or near non-detect value; as appropriate, weathering rate calculations for this result were based off the method detection limit.

`--- = Negative value; measured concentration is greater than the assumed initial concentration.

5.3 FUEL/WATER PARTITIONING COEFFICIENTS (K_{FW})

5.3.1 Site-Specific Results

Mobile LNAPL and groundwater data from the nine primary sites selected for the study were used to determine "field" and "laboratory" K_{fw} values for the BTEX compounds. As defined in Section 2.3.1.2, equation 2.2, K_{fw} is the concentration of a compound in fuel (C_f) divided by its equilibrium concentration in water in contact with the fuel (C_w). The "field" K_{fw} was calculated using groundwater and mobile LNAPL analytical results from NRMRL and OGB. The "laboratory" K_{fw} values were determined using mobile LNAPL samples in laboratory-based equilibrium partitioning experiments performed by EAL and OBG in accordance with procedures outlined by Cline *et al*. (1991) (Section 4.4.2). The field and laboratory K_{fw} values were determined to evaluate the validity of the equilibrium assumption (Section 2.3.1.3) when performing dissolution modeling. Values for K_{fw} determined from field and laboratory data are presented in Table 5.6.

The "laboratory" K_{fw} values for the BTEX compounds were expected to be lower than the "field" K_{fw} values because laboratory mixing and resulting dissolution was expected to produce maximum or equilibrium concentrations of target analytes in deionized water in contact with the fuel LNAPL. However, many of the field K_{fw} values determined using mobile LNAPL and actual groundwater results are lower than the laboratory values. Of the nine field and laboratory data sets presented in Table 5.6, data from the Offutt AFB, Seymour Johnson aerospace ground equipment (AGE) storage area, Beaufort MCAS, and Cecil Field sites generally conformed to the initial prediction. For the other sites, the field K_{fw} values for the BTEX compounds were generally higher than the laboratory values, indicating higher BTEX concentrations in groundwater than in the deionized water analyzed after equilibrium conditions were supposedly established at the laboratory.

The comparison of field and laboratory data generally suggest that dissolution of BTEX from mobile LNAPL to groundwater samples collected from within the mobile LNAPL source area may be more complete (i.e., closer to equilibrium) than the results obtained from the laboratory partitioning experiments. It is also possible that the groundwater samples collected in the field contained some emulsified LNAPL, resulting in higher BTEX concentrations than actually occurred *in situ*. The lower-than-expected BTEX concentrations in the aqueous-phase samples analyzed using the Cline *et al.* (1991) (SW8021) procedures as compared to the field groundwater results also could be at least partially attributable to 1) differences in analytical methods and 2) groundwater properties (e.g., pH, temperature, pressure, and/or salinity) and site physical properties (groundwater flow rate, soil type, precipitation, and water table fluctuations) that may have effected the dissolution and solubility of BTEX in the field relative to the laboratory.

Results of the fuel/water partitioning experiment do not necessarily refute use of equilibrium assumptions in estimating groundwater concentrations of BTEX compounds at gasoline and jet fuel release sites. However, the data presented in Table 5.6 suggest that using laboratory-derived estimates of K_{fw} to estimate equilibrium analyte concentrations in groundwater in the LNAPL source area may underestimate actual

TABLE 5.6
FUEL-WATER PARTITIONING COEFFICIENTS (K_{fw}) FOR FUEL RELEASE SITES

Data Source/Site	Approximate Spill Age[a/] (years)	Fuel-Water Partitioning Coefficients (K_{fw}) Benzene	Toluene	Ethyl-benzene	*o*-Xylene	*m&p*-Xylene	Total Xylenes
Gasoline							
Cline et al., 1991	**Fresh Gasoline**	**350**	**1,250**	**4,500**	**3,630**	**4,350**	**NA[b/]**
Offutt AFB, NE	12.1						
Equilibrium (Method 8021) (5 Data Points) [c/]		383	1,455	5,551	4,863	6,330	4,619
Field (Method 8260)[d/] (6 Data Points)		287	1,087	2,921	1,932	3,045	2,411
JP-4 Jet Fuel							
Smith et al., 1981	**Fresh JP-4**	**2,455**	**2,754**	**4,786**	**7,079**	**3,715**	**NA**
Shaw AFB, SC	8.1						
Equilibrium (Method 8021) (6 Data Points)		263	926	3,565	1,455	3,213	2,523
Field (Method 8260) (8 Data Points)		522	1,471	3,903	2,226	2,665	3,814
Myrtle Beach AFB, SC	20.6						
Equilibrium (Method 8021) (3 Data Points)		644	1,508	4,679	10,974	4,454	4,842
Field (Method 8260) (3 Data Points)		1,023	6,288	12,263	2,969	26,011	22,062
DFSP-Charleston, SC	26.4						
Equilibrium (Method 8021) (5 Data Points)		---[e/]	1,066	4,103	3,005	4,584	7,622
Field (Method 8260) (4 Data Points)		1,782	2,366	5,419	4,962	6,998	12,692
Eaker AFB, AR	28.0						
Equilibrium (Method 8021) (3 Data Points)		253	---[e/]	2,946	2,606	2,424	2,391
Field (Method 8260) (4 Data Points)		1,137	439	3,432	5,721	3,661	3,726
Seymour Johnson AFB, AGE Area	Unknown						
Equilibrium (Method 8021) (2 Data Points)		981	1,638	3,235	1,733	2,187	2,061
Field (Method 8260) (2 Data Points)		153	760	3,141	2,805	3,663	3,397
JP-5 Jet Fuel							
Beaufort MCAS, SC							
Equilibrium (EAL) (1 Data Point)	**Fresh JP-5 Sample**	**455**	**1,500**	**4,568**	**NA**	**NA**	**4,815**
Beaufort MCAS, SC	11.5						
Equilibrium (EAL) (1 Data Point)		558	1,250	4,571	2,538	4,857	3,741
Field (NRMRL) (2 Data Points)		341	345	761	1,283	1,004	1,116
Cecil Field NAS, FL (MW CEF-293-9)	20.7						
Equilibrium (EAL) (1 Data Point)		253	1,470	5,818	---[e/]	5,308	5,043
Field (NRMRL) (2 Data Points)		6,381	2,757	4,493	4,548	1,867	1,740
JP-8 Jet Fuel							
Seymour Johnson AFB, NC (MW-1S, 1997)	5.6						
Equilibrium (EAL) (2 Data Points)		240	1,005	3,127	2,894	3,384	3,087
Field (NRMRL) (3 Data Points)		566	344	3,219	1,606	4,234	3,546
Pope AFB, NC (MW-1S, 1998)	12.6						
Field (NRMRL) (1 Data Point)		50	13	5,484	9,248	2,521	7,284

[a/] Approximate age of spill as of the most recent sampling event.

[b/] NA = not available or not analyzed.

[c/] Results calculated from "equilibrium" concentrations determined by Evergreen Analytical Laboratory.

[d/] Results calculated from mobile LNAPL and groundwater concentrations as determined by the National Risk Management Research Laboratory.

[e/] --- = K_{fw} could not be calculated because this analyte was not detected above the method detection limit.

groundwater concentrations. For example, if the benzene concentration in mobile LNAPL at a JP-4 release site is known to be 1,250 mg/L, the Smith *et al*. (1981) K_{fw} value of 2,455 indicates that the benzene concentration in groundwater immediately adjacent to the water-LNAPL boundary is approximately 0.51 mg/L (obtained by rearranging equation 2.2 to solve for C_w; C_w = 1,250 [mg/L] / 2,455 = 0.51 mg/L).

However, K_{fw} results presented in Table 5.6 indicate that a benzene K_{fw} of 923 (average of five field values for JP-4 sites) is more appropriate. The application of a benzene K_{fw} of 923 to the benzene concentration of 1,250 mg/L in LNAPL indicates that the predicted benzene concentration in groundwater would be approximately 1.35 mg/L, which is significantly higher than the groundwater concentration predicted using the Smith *et al*. (1981) benzene K_{fw}.

Although equilibrium LNAPL/water partitioning coefficients can be used to estimate analyte concentrations in groundwater or LNAPL, determination of site-specific field K_{fw} values where possible is desirable. However, care must be taken during groundwater sampling to avoid inclusion of emulsified fuel in the water sample.

A consistent relationship between mobile LNAPL weathering and fuel/water partitioning was not observed. This is specifically demonstrated by the five JP-4 sites, where field and laboratory values for K_{fw} do not vary consistently with increasing spill age. The wide variation in K_{fw} values calculated for the JP-4 sites, coupled with a lack of a consistent relationship between K_{fw} and spill age, indicates that the partitioning coefficient between mobile LNAPL and groundwater is dependant on site-specific conditions such as groundwater flow rate, soil type, precipitation, groundwater geochemistry, and water table fluctuations.

In addition, review of the K_{fw} data presented in Table 5.6 indicates that K_{fw} also is dependant upon fuel type. Fuel types that contain relatively high concentrations of the BTEX components, such as gasoline, tend to have relatively low K_{fw} values with respect to fuel types that contain relatively low concentrations of BTEX components. Thus, the partitioning coefficient between fuel LNAPL and groundwater appears to be partially dependant upon the concentration of BTEX components within the LNAPL phase. This variability in partitioning coefficients with fuel compound concentrations in LNAPL would be expected to follow Roults Law (Section 2.3.1).

5.3.2 Source-DK Modeling of LNAPL and Groundwater Concentrations

A review of data from 366 petroleum (predominantly gasoline) contaminated sites was used to estimate average decay rates for BTEX compounds dissolved in source area groundwater (Farhat, *et al*., 2002). Average first-order decay constants of 22 %/yr, 41 %/yr, 18 %/yr, and 25 %/yr, were calculated for benzene, toluene, ethylbenzene, and xylenes, respectively. These rates were calculated using historical data from source area wells with the highest BTEX concentrations. No attempt was made to distinguish sites that had mobile LNAPL. When only data from the 180 most-contaminated sites was evaluated, the average first-order decay rate for benzene decreased from 22 %/yr to 16 %/yr. Benzene decay rates at the 180 most-contaminated sites are more likely to representative of sites containing mobile LNAPL.

The Source-DK model was used to estimate the LNAPL weathering rate at the Shaw AFB Building 1610 Site. The Shaw AFB site was selected because it has a known spill date, initial LNAPL analysis of BTEX fractions, three LNAPL and groundwater sampling events, and reasonable assurance that no additional spills have occurred. Site-specific data on LNAPL plume dimensions and the initial mass fraction of benzene were used as input data for the "Tier 2 Box Model." No biodegradation was assumed in this model run.

The Source-DK Model predicted that benzene concentrations in the LNAPL would be reduced at a first-order rate of 18 %/yr. The average benzene loss rate based on three LNAPL sampling events is 17 %/yr. The model predicted a dissolved benzene concentration of 2.1 mg/L at the six-year point; actual site data shows an average concentration of 2.5 mg/L. The model also predicted groundwater concentrations of benzene over the next 50 years. Based on the predicted LNAPL weathering rate, groundwater concentrations of benzene will approach the 5-microgram per liter (µg/L) MCL in approximately 40 years (mid-range estimate).

The data set generated for the Source-DK model (GSI, 2002) includes groundwater BTEX results from source areas at 366 sites. Readers who are interested in estimating source decay rates for gasoline sites are encouraged to use the methodology presented in the user's guide for this model.

5.4 COMPARISON OF RESIDUAL AND MOBILE LNAPL WEATHERING

Weathering effects on residual-LNAPL-contaminated soils were compared to mobile LNAPL weathering in an effort to compare LNAPL weathering in capillary fringe soils with LNAPL weathering in the free-phase product. The primary weathering mechanisms thought to enhance weathering of residual LNAPL in soils include increased volatilization and biodegradation. Little to no BTEX depletion in mobile LNAPL is expected to occur as a result of biodegradation, yet biodegradation is a significant weathering mechanism for residually-contaminated soils (Section 2.3.3). Section 5.4.1 presents a brief quantitative evaluation of BTEX weathering in residual and mobile LNAPLs. Section 5.4.2 presents a qualitative comparison of hydrocarbon weathering in mobile and residual LNAPL through the use of soil and free product chromatograms from the DFSP-Charleston site.

5.4.1 BTEX Weathering

BTEX weathering in residual and mobile LNAPL was compared by converting soil analytical results reported on a mass per mass basis (i.e., mg/kg) to a mass per volume basis typical of mobile LNAPL results (i.e., micrograms per milliliter [µg/mL], mg/mL, or mg/L). The following relationship was used to estimate the concentration of BTEX compounds in residual LNAPL based on soil analytical results:

$$C_s = [\text{BTEX (mg/kg)} / \text{TPH (mg/kg)}] \times \text{LNAPL density } (\mu g/mL)$$

eq. 5.9

where: C_s = estimated residual LNAPL BTEX concentration (µg/mL)
TPH = total petroleum hydrocarbons in residual LNAPL

Note: TPH concentrations in soil were estimated by NRMRL analysis of total fuel carbon.

Table 5.7 presents the BTEX concentrations in residual LNAPL estimated using equation 5.9, and compares these estimates to the mobile LNAPL analytical results at the eight primary sites.

Based on the results presented in Table 5.7, BTEX concentrations in residual LNAPL at Offutt and Shaw AFBs were generally attenuated relative to concentrations in mobile LNAPL. At Offutt AFB, estimated concentrations of toluene, ethylbenzene, and xylenes in capillary fringe soils were 5 to 23 percent less than their respective concentrations in mobile LNAPL. Based on the 1997 Shaw AFB soil data, BTEX concentrations in residual LNAPL were 1 to 34 percent less than in mobile LNAPL. Soil samples collected at Shaw AFB in 1998 contained much lower BTEX concentrations at a depth of 27 feet bgs than soil samples collected at a depth of 33 feet bgs in 1997. This data indicates that the 27 foot interval samples may have been above the smear zone.

At DFSP-Charleston, the estimated residual LNAPL concentrations of BTEX exceed the mobile LNAPL concentrations. As indicated on Figures 5.7 and 5.8, the total BTEX concentration in mobile LNAPL at EW-6 has been reduced by almost 99 percent. While BTEX concentrations in mobile LNAPL at EW6 are extremely low, the total BTEX concentration of 230 mg/kg in soil at 13 feet bgs near EW-6 was the highest total BTEX concentration measured in soil at any of the JP-4 sites (Table 5.1). While significant BTEX depletion is evident in mobile LNAPL, significant BTEX contamination appears to persist in soils near this location.

Overall, residual LNAPL concentrations of BTEX in soil at most sampled locations, estimated using equation 5.9, exceed measured mobile LNAPL concentrations for these compounds. Predicted residual LNAPL concentrations calculated from soil analytical results for seven of the eight primary sites, Charleston was not included because the LNAPL results were close to the method detection limits, which are approximately 1 to 7 times higher than the mobile LNAPL analytical results. AFCEE (1995) note that use of the BTEX/TPH relationship contained in equation 5.9 to compare residual and mobile LNAPL concentrations results in overestimation of the residual BTEX concentration, especially within the LNAPL source area. In theory, the residual BTEX concentrations should never exceed the mobile LNAPL BTEX concentrations. A significant source of error in equation 5.9 is the TPH term. TPH analysis is prone to underestimation of the total fuel residual in the soil. Underestimation of TPH would lead to the false conclusion that the BTEX fraction in soil residuals exceeds the BTEX fraction in mobile LNAPL.

5.4.2 Comparison of Soil and Mobile LNAPL Chromatograms

A qualitative comparison of residual LNAPL and mobile LNAPL weathering was performed by evaluating chromatograms of soil and free product samples. Figure 5.12 presents GC/FID results for mobile LNAPL samples collected from two wells (MW-103 and EW-6) at the DFSP-Charleston site. Soil sample GC/FID results for one soil boring (CHSB3) advanced in the original source area at the DFSP-Charleston site are presented on Figure 5.13. Results presented on these two figures are from samples collected in

TABLE 5.7
COMPARISON OF ESTIMATED RESIDUAL AND MOBILE LNAPL BTEX CONCENTRATIONS
FUEL WEATHERING STUDY

Fuel Type Site	Sample Date	Free Product Sample Location	Approximate Spill Age[a/]	Depth to Product (feet btoc)[b/]	Depth of Soil Sample (feet bgs)[c/]	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total BTEX
Gasoline										
Offutt AFB, NE	Nov-94	MW349-1	4	39.60	39.5					
Estimated Residual LNAPL[d/] (µg/mL)[e/]						16,034	39,335	9,141	32,217	96,727
Mobile LNAPL[f/] (µg/mL)						8,280	41,100	10,300	42,080	101,760
Estimated Residual / Mobile						1.94	0.96	0.89	0.77	0.95
JP-4 Jet Fuel										
Shaw AFB, SC	Mar-97	MW1610-2	3	32.38	33.0					
Estimated Residual LNAPL (µg/mL)						2,225	3,220	916	6,619	12,980
Mobile LNAPL (µg/mL)						2,250	4,890	1,340	8,530	17,010
Estimated Residual / Mobile						0.99	0.66	0.68	0.78	0.76
Shaw AFB, SC	Mar-98	MW1610-2	4	28.24	27.0					
Estimated Residual LNAPL (µg/mL)						101	168	561	2,687	3,517
Mobile LNAPL (µg/mL)						1,250	2,830	1,040	7,180	12,300
Estimated Residual / Mobile						0.08	0.06	0.54	0.37	0.29
Myrtle Beach AFB, SC	Mar-97	MW8I	16	3.7	9.5					
Estimated Residual LNAPL (µg/mL)						1,536	8.4	3,324	9,666	14,535
Mobile LNAPL (µg/mL)						211	7.5	1,360	4,262	5,841
Estimated Residual / Mobile						7.28	1.12	2.44	2.27	2.49
DFSP-Charleston (Tank 1), SC	May-97	EW-6	22	15.92	13.0					
Estimated Residual LNAPL (µg/mL)						85	1,764	2,789	14,082	18,721
Mobile LNAPL (µg/mL)						0.025	1.35	91.3	351	444
Estimated Residual / Mobile						3415	1307	31	40	42
Eaker AFB, AR	Aug-97	MW316	24	13.86	12.0	2,658	10	4,086	20,011	26,764
Estimated Residual LNAPL (µg/mL)						900	0.025	2,960	15,400	19,260
Mobile LNAPL (µg/mL)						2.95	384	1.38	1.30	1.39
Estimated Residual / Mobile										

TABLE 5.7 (Continued)
COMPARISON OF ESTIMATED RESIDUAL AND MOBILE LNAPL BTEX CONCENTRATIONS
FUEL WEATHERING STUDY

Fuel Type Site	Sample Date	Free Product Sample Location	Approximate Spill Age[a/]	Depth to Product (feet btoc)[b/]	Depth of Soil Sample (feet bgs)[c/]	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total BTEX
JP-5 Jet Fuel										
Beaufort Tank Farm C, SC	May-97	BFT-401-3	7	6.98	4.0					
Estimated Residual LNAPL (µg/mL)						7.6	93	557	1,820	2,477
Mobile LNAPL (µg/mL)						2.2	13	116	611	742
Estimated Residual / Mobile						3.41	7.16	4.80	2.98	3.34
Cecil Field NAS, FL	May-97	CEF-293-9	16	8.54	8.5					
Estimated Residual LNAPL (µg/mL)						27	479	3,925	10,574	15,004
Mobile LNAPL (µg/mL)						24	122	2,520	4,787	7,453
Estimated Residual / Mobile						1.13	3.92	1.56	2.21	2.01
JP-8 Jet Fuel										
Seymour Johnson AFB, NC	May-97	MW1S	2	5.08	5.5					
Estimated Residual LNAPL (µg/mL)						386	2,311	2,004	10,441	15,142
Mobile LNAPL (µg/mL)						194	1,030	1,170	5,990	8,384
Estimated Residual / Mobile						1.99	2.24	1.71	1.74	1.81
Seymour Johnson AFB, NC	Mar-98	MW1S	3	3.11	3.0					
Estimated Residual LNAPL (µg/mL)						181	1,020	1,440	6,016	8,658
Mobile LNAPL (µg/mL)						47	602	800	3,040	4,489
Estimated Residual / Mobile						3.84	1.69	1.80	1.98	1.93

[a/] Approximate age of spill at time of sampling event.

[b/] feet btoc = feet below top of well casing.

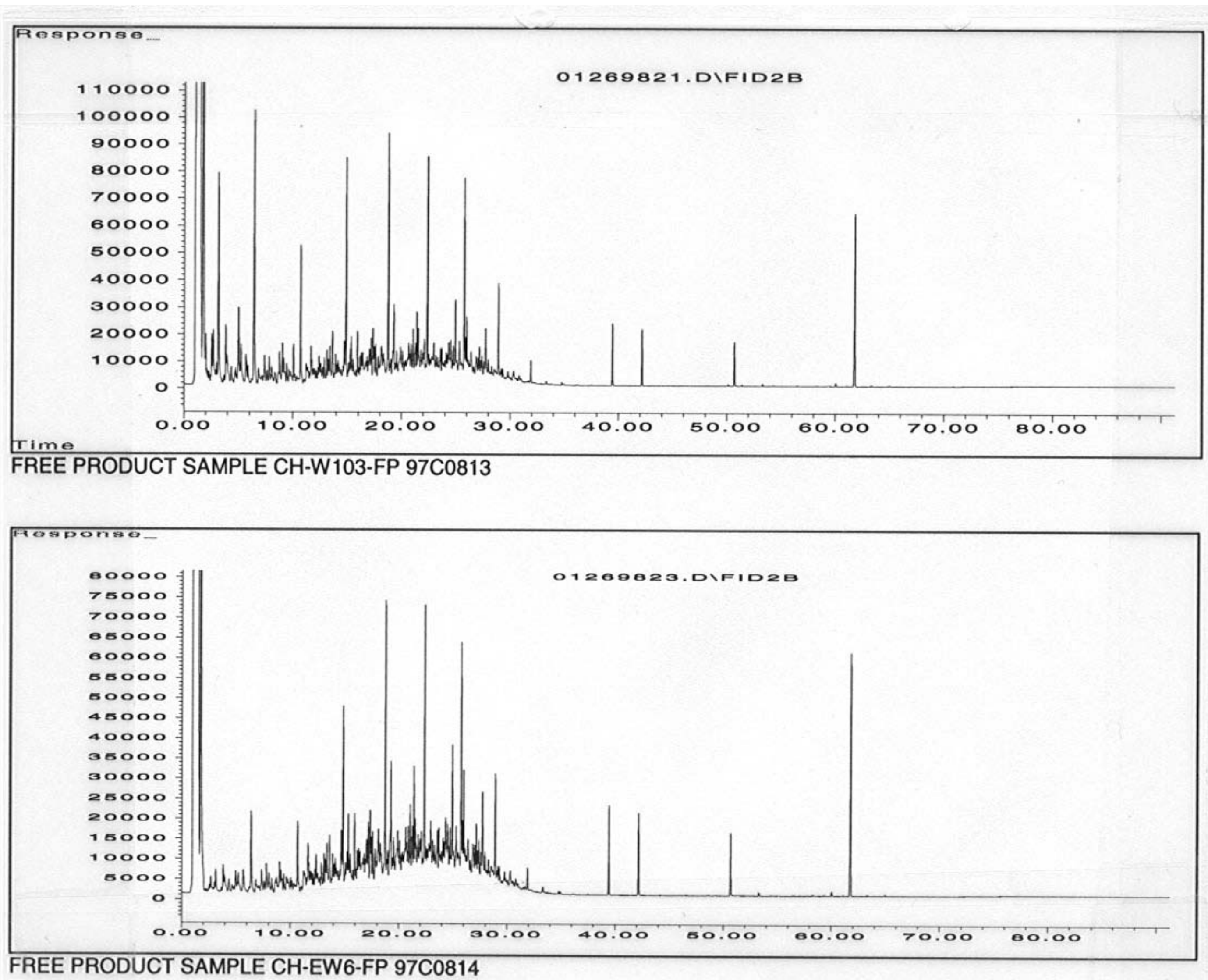
[c/] feet bgs = feet below ground surface.

[d/] Estimated mass per unit volume concentration in residual LNAPL calculated using equation 5.9 and NRMRL soil sample results.

[e/] µg/mL = micrograms per milliliter.

[f/] Mobile LNAPL concentration as determined by NRMRL.

FIGURE 5.12
CHROMATOGRAMS FOR TWO JP-4 MOBILE LNAPL SAMPLES
DFSP-CHARLESTON, SOUTH CAROLINA
FUEL WEATHERING STUDY



Source: AD Little (1998).

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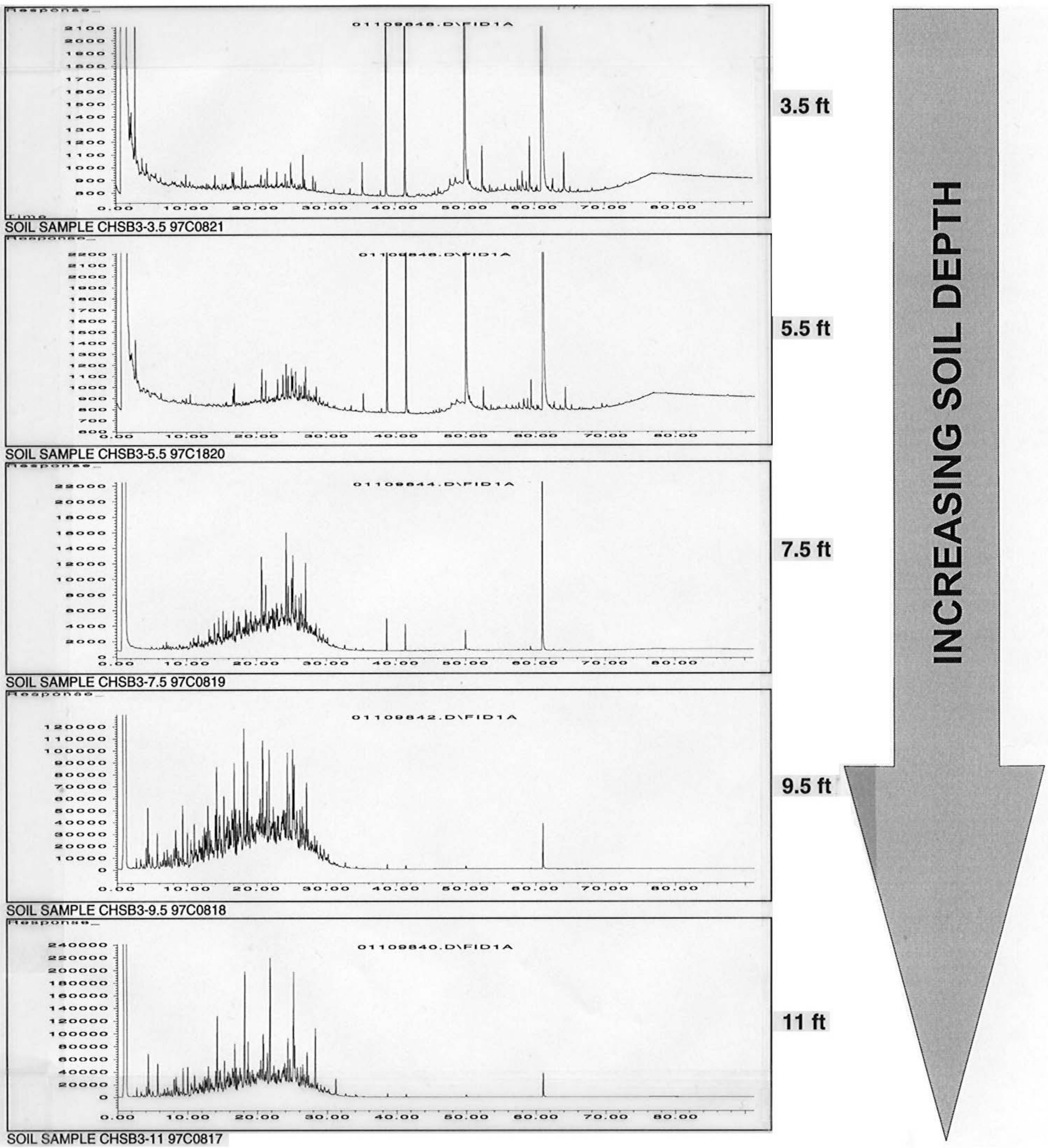
FIGURE 5.13
JP-4 IMPACTED SOIL CHROMATOGRAM RESULTS WITH DEPTH
DFSP-CHARLESTON, SOUTH CAROLINA
FUEL WEATHERING STUDY



Source: AD Little (1998).

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May 1997 and analyzed by AD Little (1998). During this sampling event, the water table was measured approximately 15 to 16 feet bgs.

Chromatograms for the soil samples indicate that concentrations of single-ring aromatic hydrocarbons (e.g., BTEX) in residual LNAPL generally increase with depth, and likely approach concentration levels comparable to mobile LNAPL near the water table. The chromatographic peaks for the BTEX compounds occur within the first 10 minutes of the analysis (i.e., between 0.00 and 10.00 on the x-axis of the chromatograms). As shown on Figure 5.13, concentrations of BTEX compounds in soils at the 3.5-, 5.5-, and 7.5-foot depths are relatively low. In contrast, soil samples collected at 9.5 and 11 feet bgs appear to retain the general chromatographic signature of the JP-4 mobile LNAPL samples (Figure 5.12). BTEX weathering appears to be approximately the same in these deeper soils as the weathering observed in mobile LNAPL from EW-6 (evidenced by the similarities between the chromatogram from the 11 foot depth interval and the chromatogram from the EW-6 LNAPL sample), but more significant than that observed in mobile LNAPL from MW-103. As discussed in Sections 2.5.1 and 5.2.3.5.2, mobile LNAPL weathering appears to vary spatially at fuel-contaminated sites. Residual LNAPL weathering rates most likely vary with proximity to saturated LNAPL lenses and mobile LNAPL pools.

In theory, sites with more-porous soils and without impermeable covers should promote greater residual LNAPL volatilization and biodegradation. Sites which are not subject to large and frequent water-level variations also should produce a more-weathered residual LNAPL because these soils would not be regularly "recontaminated" with mobile LNAPL as the water table rises and falls. Based on our study, it is impossible to predict residual LNAPL weathering rates from the limited soil sampling performed at each site. Several soil samples need to be collected at each depth interval to more accurately estimate the remaining BTEX fraction in residual LNAPL in the soil column.

SECTION 6

CONCLUSIONS

6.1 REVIEW OF PROJECT OBJECTIVES

The overall purpose of this study is to improve the scientific database for estimating natural LNAPL weathering rates and source-term reduction rates which are incorporated into natural attenuation models. Specifically, the primary objective was to document a range of BTEX weathering rates for the mobile LNAPL fraction based on data collected from sites with documented mobile LNAPL plumes with known release dates. Secondary objectives of this study included an evaluation of the degree of contaminant partitioning of BTEX from mobile LNAPL to groundwater, and comparison of weathering effects on the mobile LNAPL fraction and on residual LNAPL present in capillary fringe soils.

Based on our literature review, little information has been published regarding rates of natural weathering of the BTEX compounds from mobile fuel LNAPLs. As a result, the rate of reduction of the contaminant source term in groundwater models is often left to professional judgment. This uncertainty has generally resulted in the use of overly conservative LNAPL weathering rates to evaluate contaminant fate and transport and the suitability of natural attenuation as a remedial alternative. These conservative assumptions extend the estimated timeframe for achieving cleanup goals and inflate projected LTM and site management costs. When appropriate input data are available, the new SourceDK model (GSI, 2002) is a useful tool for predicting LNAPL and groundwater concentrations of BTEX over time, and the source decay term for use in groundwater fate and transport models.

The following tasks were completed to meet the stated primary and secondary objectives:

- A literature search to assess existing information regarding weathering of LNAPLs;
- Selection of eight primary sites where the time of release is generally known and free-phase jet fuel or gasoline remain *in situ*;
- Sampling of soil, groundwater, and free-phase LNAPLs at the primary sites;
- Evaluation of data obtained from the eight primary sites and from four secondary sites to assess contaminant concentrations in site media in relation to such factors as age of the fuel release, fuel type, and site geology and hydrogeology;

- Calculation of site specific LNAPL weathering rates and LNAPL to groundwater diffusion coefficients;

- Calculation of estimated residual and mobile LNAPL BTEX concentration ratios; and

- A "beta test" of the new SourceDK model (GSI, 2002) was completed using LNAPL and groundwater data from a Shaw AFB JP-4 jet fuel spill.

6.2 SUMMARY OF FINDINGS

- Significant research has been completed on multiple "fresh" samples of JP-4 and JP-8 so that the magnitude of the initial BTEX fraction in these fuels is well-known. The assumption that initial BTEX values in mobile LNAPL at JP-4 and JP-8 release sites are equal to concentrations reported by Smith *et al.* (1981) and Mayfield (1996) appears reasonably valid for predicting BTEX depletion in mobile LNAPL. Initial fuel composition results for gasoline studies are more varied, and results for JP-5 are very limited.

- BTEX weathering rates in mobile LNAPL will vary from site to site and are influenced by many factors including spill age, the relative solubility of individual compounds, free-product geometry, and the rate at which groundwater and precipitation contacts mobile LNAPL.

- As demonstrated by the DFSP-Charleston and Offutt AFB site data, the BTEX fraction remaining in mobile LNAPL samples collected from different locations on the same site will vary. It is likely that samples collected near the center of the LNAPL "plume" will exhibit lower rates of weathering than samples collected at the leading edge of the plume. Based on Raoult's Law, weathering of BTEX from LNAPL via dissolution and volatilization is expected to follow first-order kinetics, which predicts that the rate of BTEX removal from the free phase will be reduced as the concentrations of BTEX in the free phase decrease over time. While this phenomenon is difficult to prove with only one or two historical data points per site, the occurrence of first-order weathering kinetics appears to be validated when average remaining BTEX fractions from five JP-4 sites are plotted together. Based on the data obtained for this study, weathering rates decreased as the age of the spill increased.

- Based on Table 5.2, the average total BTEX, first-order weathering rate for six JP-4 sites is approximately 15.1 %/yr. Based on all of the data collected, this appears to be a reasonable default value for estimating total BTEX weathering from JP-4 LNAPL.

- If mathematically-inflated rates from McChord AFB data are excluded, the range of total BTEX first-order weather rates is 4.3 to 28 %/yr. If a more conservative first-order weathering rate is desired for BTEX fate and transport modeling, the mean of the total BTEX weathering rate data set of 13 %/yr would provide a conservative estimate for JP-4 fuels.

- As predicted by their relatively high solubilities, benzene and toluene exhibit higher weathering rates than ethylbenzene and xylenes. Because benzene is a known human carcinogen with a federal MCL of 5 μg/L, benzene weathering rates will generally determine the timeframe for fuel spill remediation. Based on Table 5.2, the average benzene first-order weathering rate for six JP-4 sites is approximately 23.3 %/yr. Based on all of the data collected, this appears to be a reasonable default value for estimating benzene weathering from JP-4 LNAPL.

- If mathematically inflated rates from McChord AFB data are excluded, the range of benzene first-order weather rates is 11.1 to 39 %/yr. If a more conservative first-order weathering rate is desired for benzene fate and transport modeling, the median of the first order benzene weathering rate data set of 22 %/yr would provide a conservative estimate for JP-4 fuels.

- Dissolution appears to be the primary weathering mechanism that influences mobile LNAPL weathering rates. Significantly lower BTEX weathering rates in mobile LNAPL were apparent at sites with low groundwater velocities. This observation is supported by mass transfer theory, which predicts that BTEX flux from LNAPL to groundwater would increase in a rapidly moving groundwater where dissolved BTEX concentrations would be diluted by the constant influx of clean water.

- LNAPL and groundwater data from the Shaw AFB JP-4 spill was used for a "beta test" of the new SourceDK Tier 2 Box Model (GSI, 2002). Results showed excellent agreement between predicted LNAPL weathering rates for benzene and actual benzene weathering rates base on 6 years of LNAPL sampling. Predicted source area groundwater concentrations of benzene (no biodegradation option) were also within 20% of average source area benzene concentrations measured after 6 years of weathering.

- Although initial BTEX fractions in JP-8 are lower than JP-4, the calculated first-order weathering rate for the Seymour Johnson JP-8 site was 21 %/yr for total BTEX and 25 %/yr for benzene (Table 6.1). These average weathering rates are very similar to average first-order benzene (21 %/yr) and total BTEX (20 %/yr) weathering rates computed for Shaw AFB (Table 5.2). This similarity indicates that the two releases, which are both approximately the same age, are weathering at approximately the same rate. Thus, the first-order weathering rates calculated for JP-4 should provide reasonable estimates for JP-8 LNAPL plumes. Benzene and total BTEX first-order weathering rates for JP-4 and JP-8 are shown in Table 6.1.

- The Source-DK model provides a useful tool for estimating both LNAPL and soil residual decay rates and future groundwater concentrations in close proximity to the source area. The ability of this model to provide accurate predictions depends upon the quality of the input data. In order to make high quality source decay predictions using the Source-DK model, actual fuel component concentration data overtime from LNAPL and groundwater, high quality soil and hydraulic data, and geochemical data are required. As demonstrated with Shaw AFB site data (Section 5.3.2), a complete set of LNAPL and groundwater data is very useful in verifying the predictions of the SourceDK model.

TABLE 6.1
SUMMARY OF BENZENE AND TOTAL BTEX FIRST ORDER WEATHERING RATES IN JP-4AND JP-8 MOBILE LNAPL
FUEL WEATHERING STUDY

	Benzene (% Reduction/year)[a/]	Total BTEX (% Reduction/year)
JP-4 Mobile LNAPL		
Average of 6 sites	23.3	15.1
Range Excluding McChord	11 to 39	4 to 28
Conservative Estimate	12.8	12.8
JP-8 Mobile LNAPL[b/]		
Range	6 to 53	10 to 35
Conservative Estimate	25.1	21.4

[a/] Weight percent per year calculated using equation 5.8.

[b/] Summary of 6 samples collected over 5 years from the Seymour Johnson AFB site.

6.3 RECCOMENDATIONS

Based on the findings of this project, the following recommendations are made concerning the proper estimation of LNAPL and source area weathering rates:

- Whenever possible, LNAPL samples should be collected and analyzed for BTEX and other contaminants of concern. Biennial (i.e., every other year) sampling should be sufficient to establish LNAPL weathering patterns and rates. If possible, the initial LNAPL in the well should be purged to allow product from the formation to be sampled and analyzed.

- The chemical composition of LNAPL at a site is spatially variable; therefore, it is prudent to collect samples from at least three wells, if possible so that the calculated weathering rates are representative of the entire LNAPL plume. The average mass fractions of BTEX components can then be used as input to source decay and groundwater fate and transport models.

- When LNAPL is absent in wells, soil samples should be collected in the free product smear zone. Several smear zone locations should be sampled, with samples collected from at least two depths per boring. Samples should be analyzed for BTEX, TPH, and other contaminants of concern. Both Total Extractable Petroleum Hydrocarbons (TEPH) and Total Volatile Petroleum Hydrocarbons (TVPH) should be analyzed and the results summed to provide a total number representative of a wide range of carbon values. Fuel compound weathering rates can than be calculated from the soil data to estimate how long the residual contaminant mass will continue to act as a secondary source of contaminant mass to groundwater.

- As a last resort, groundwater samples from the source area can be used to estimate the strength of the mobile or residual LNAPL source. As demonstrated in our findings, water samples may not be at equilibrium with LNAPL or soil residuals, and analyte concentrations in groundwater samples may be biased high due to inclusion of emulsified LNAPL in the samples.

- In the absence of site-specific LNAPL or source area soil data, the data presented in this report can be used in conjunction with default data provided in the SourceDK Model to make an order-of-magnitude estimate of source BTEX decay rates. However, site-specific factors such as groundwater velocity, soil type, water infiltration rates, fuel type, and spill age should be used as appropriate to refine the estimated source decay rates using the information provided in this report (e.g., by comparison to site-specific weathering rates derived for sites having similar conditions).

SECTION 7

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APPENDIX A

FUEL WEATHERING STUDY UPDATE WORK PLAN

FINAL

TECHNICAL MEMORANDUM

27 August 2001

To: Mr. Jerry Hansen, AFCEE/ERT

From: Mr. Bruce Henry, Parsons Engineering Science, Inc.

Subject: Final Work Plan for an Addendum to the Fuels Weathering Study (Parsons ES, 1999a), Contract No. F41624-00-D-8024, Task Order No. 0024

This technical memorandum provides the scope of work for completing an addendum to the *Final Light Nonaqueous-Phase Liquid Weathering at Various Fuel Release Sites* (Fuels Weathering Study) (Parsons Engineering Science, Inc. [Parsons ES], 1999a). This work plan is based on the statement of work for Task Order No. 0024 of the Air Force Center for Environmental Excellence (AFCEE) Contract No. F41624-00-D-8024. This technical memorandum describes the background and objective of the addendum, lists the sites for which additional fuels data may be collected, and describes the sampling and laboratory protocols to be followed.

BACKGROUND

The primary objective of the Fuels Weathering Study (Parsons ES, 1999a) was to determine natural weathering rates for benzene, toluene, ethylbenzene, and xylenes (BTEX) in mobile light non-aqueous phase liquids (LNAPL, or free product). Rates were based on literature values and sample data collected from sites with mobile LNAPL plumes that are a result of past jet fuel or gasoline releases. Three secondary objectives were 1) to review the available literature as it pertains to natural weathering of fuel LNAPLs in the subsurface environment; 2) to compare weathering effects on the mobile LNAPL fraction and on residual LNAPL present in capillary fringe soils; and 3) to evaluate the degree of contaminant partitioning occurring from mobile LNAPL to groundwater.

OBJECTIVES

Results of the fuels weathering study were encouraging, however, the range of fuel types and the size of the statistical database for calculating fuel weathering rates was limited. Therefore, the objectives of this Fuels Weathering Study addendum are to expand the data set collected for the initial study in order to provide weathering rates for a greater range of fuel types, and to increase the size of the data set upon which rate calculations are based. Results of this addendum will be use to support and/or amend the conclusions developed in the Fuels Weathering Study (Parsons ES, 1999a).

SCOPE OF WORK

The following tasks will be conducted for the Fuels Weathering Study addendum:

- Perform a literature review of recently published articles, papers, and conference proceedings at a local university.
- Collect data from published literature as well as from representative Department of Defense (DOD) projects. Site selection criteria established in the Fuels Weathering Study will be used for the selecting appropriate DOD sites.
- Conduct up to six site visits for the purpose of resampling mobile LNAPL and groundwater at sites where Parsons ES collected data for the Fuels Weathering Study.
- Two wells will be sampled at each site for analysis of BTEX, trimethylbenzenes (TMBs), and naphthalene in LNAPL and groundwater by USEPA Method SW8260B. In addition, LNAPL samples will be analyzed for equilibrium partitioning by USEPA Method SW8021B, in accordance with the methods of Cline, *et al*. (1991).
- The six sites will be sampled in two mobilizations of approximately 4 to 5 days in duration. A Parsons ES field technician will sample the wells with the aid of local Base personnel. Base personnel will be responsible for disposal of any investigation-derived waste generated as a result of the sampling.
- Except as amended in this technical memorandum, sampling will occur in accordance with the *Draft Work Plan for Determining LNAPL Weathering at Various Fuel Release Sites* (Parsons ES, 1999b).
- Up to six additional sets of samples for additional sites provided by Base personnel or AFCEE will be analyzed as above.
- Parsons ES will complete and submit a draft addendum to the Fuels Weathering Study summarizing the results of sampling and data collection. One set of responses to AFCEE comments will be prepared and incorporated into a final addendum.

Evaluation of weathering effects on mobile and residual LNAPL present in capillary fringe soils is not included in this effort. Therefore, soil samples will not be collected for this project.

SITE SELECTION

Sampling conducted for the addendum by Parsons ES will primarily include sites and monitoring wells that were sampled for LNAPL and groundwater during the original Fuels Weathering Study. The facilities and sites sampled during the fuels weathering study are listed in Table 1. Preference will be given to sites that have not undergone active remediation. Because of the small amount of free product detected at some of the sites sampled during the original study, it is expected that those sites may no longer have sufficient quantities of LNAPL for sample collection.

Free product and groundwater sampling is planned to occur in two mobilizations. The initial mobilization is scheduled to occur in August 2001, and will include Seymour Johnson Air Force Base (AFB) in North Carolina, and Shaw AFB and Myrtle Beach AFB in South Carolina. Sites for the second mobilization will be selected at a later date, after confirming appropriate site conditions with Base personnel.

FIELD PROCEDURES FOR SAMPLE COLLECTION AND ANALYSIS

LNAPL and groundwater samples will be collected in a manner similar to that used for the initial Fuels Weathering Study. In executing the *Draft Work Plan for Determining LNAPL Weathering at Various Fuel Release Sites* (Parsons ES, 1999b) during the initial fuels weathering study, it was necessary to make variances from the work plan. For this addendum, sample collection will be completed so that the actual sample collection procedures used in the initial study are duplicated.

Sample Collection Procedures-

- Immediately after unlocking and opening the well, volatile organics within the well casing and the working space breathing zone will be measured with a photoionization detector (PID).
- An oil/water interface probe will be used to measure the depth to free product, the apparent free product thickness, and the depth to groundwater to the nearest 0.01 foot.
- Two to four free product samples and one groundwater sample will be collected at each monitoring well. Only two free product samples will be shipped to the laboratory for analysis. Free product will be collected from the initial column of free product in the well, and from the column of free product that recharges into the well following purging. If the well does not recharge with free product in a reasonable time (1 to 2 hours), the “prepurge” sample will be submitted for analysis. Samples will be collected with the following procedure:

- At sites were free product is approximately 25 feet or less below the ground surface, high density polyethylene (HDPE) tubing will be slowly lowered down the well so that the end of the tubing is within the column of LNAPL. Two samples of product then will be collected from the well using a peristaltic pump. For sites where free product is more than 25 feet below ground (e.g. Shaw AFB) a disposable bailer will be used to collect LNAPL and groundwater samples.
- Once the "prepurge" sample vials have been filled, LNAPL will continue to be purged until at least one volume equivalent to the initial volume of LNAPL measured in the well casing has been removed.
- After the pre-purge LNAPL samples have been collected and LNAPL purged from the well, new sample tubing or a new bailer will be lowered through the LNAPL column into the water column. A water sample will be collected from the water below the LNAPL. For wells sampled with a peristaltic pump, a low flow purge not to exceed two casing volumes will be used to minimize purge volumes. For wells sampled with a bailer, groundwater will not be purged prior to collecting a groundwater sample to avoid disturbance and mixing of groundwater and LNAPL within the well and samples.
- After the groundwater samples have been collected, LNAPL will be allowed to recharge in the well for a period not to exceed two hours. The sample tubing will be raised so that it is within the LNAPL column and two LNAPL samples will then be collected. Similarly, "fresh" LNAPL samples will be collected with a bailer where a peristaltic pump cannot be used.
- Once all the samples have been collected, labeled, and placed in a cooler with ice, all sampling supplies will be removed from the well and placed in a plastic bag for disposal by the Base.

• Investigation-derived waste (IDW) is anticipated to include small volumes of LNAPL and groundwater, sample tubing, disposable bailers, nitrile gloves, and water used for decontamination of the oil/water interface probe. IDW will be disposed of by Base personnel.

Sample Identification and Chain-of-Custody Control, and shipment – Samples will be labeled so that they can be clearly identified as to the facility, monitoring well and sample matrix (i.e., water or LNAPL). Sample identification will be as follows:

FACILITY/WELL-ID/MATRIX/DATE

For example, for water and LNAPL samples collected from monitoring well MW1610-2 at Shaw Air Force Base (AFB) on 05 August 2001, the sample identification would be:

SH/MW1610-2/WATER/080501

SH/MW1610-2/LNAPL/080501

Chain-of-custody forms will accompany all sample shipments and will clearly identify at which facilities samples were collected. After the samples are sealed and labeled, they will be packaged for transport to the laboratory via Federal Express overnight delivery

Sampling Records – Sampling records will be kept in accordance with the *Draft Work Plan for Determining LNAPL Weathering at Various Fuel Release Sites* (Parsons ES, 1999b), to include a field logbook narrative and sampling forms.

Sample Analysis – LNAPL and groundwater samples will be analyzed by O'Brien & Gere Laboratories, Inc. (OBG) in Syracuse, New York. Analytical protocols will be performed as listed in Table 2. Quality Assurance/Quality Control (QA/QC) samples will be collected and analyzed as presented in Table 3. Laboratory QA/QC will be in accordance with the Description of Work and Schedule for laboratory analytical services included as Attachment A.

Decontamination Procedures - Prior to arriving at the site, and between each sampling location, downhole equipment such as oil/water interface probes will be decontaminated using the following protocol:

- Wash with potable water and phosphate-free laboratory detergent
- Rinse with potable water;
- Rinse with distilled or deionized water; and
- Air dry.

All rinseate will be collected for proper disposal by Base personnel. Alternate methods of rinseate disposal will be considered by the Parsons ES field scientist as recommended by Base personnel. Precautions will be taken to minimize any impact to the surrounding area that might result from decontamination operations.

Any deviations from these procedures will be documented in the field logbook and on the groundwater or LNAPL sampling record.

REPORTING AND SCHEDULE

Site sampling by Parsons ES is planned to occur in two mobilizations. The initial mobilization is scheduled to occur in August 2001, and will include Seymour Johnson Air Force Base (AFB) in North Carolina, and Shaw AFB and Myrtle Beach AFB in South Carolina. The second sampling event is tentatively scheduled for September or October 2001. Actual sites for the second sampling event will be selected at a later date, after confirming appropriate site conditions with Base personnel. A draft addendum will be submitted to AFCEE for review by 10 December 2001. Responses will be prepared to comments on the draft addendum, and incorporated into a final addendum to be submitted to AFCEE by 07 March 2002.

TABLE 1
SUMMARY OF WELLS AND SITES SAMPLED
FUELS WEATHERING STUDY ADDENDUM

Base/Location	Site	Fuel Type	Date Sampled	Well Identification	Laboratory[a/]	Free Product	Water	BTEX[b/]	TMBs[b/]	Methyl-Naphthalenes	Density	LNAPL Thickness and Date (feet)	Depth to LNAPL (feet)	Depth to Water (feet)
Primary Sites														
Offutt AFB, NE	Tank 349	Gasoline	Nov-94	MW349-1	NRMRL	X	X	FP	--	--	--	--	--	--
			Jun-96	MW349-6	NRMRL	X	X	FP	--	--	--	2.23(6/96)	39.60	39-42
			Jun-97	MW349-6	EAL, NRMRL	X	X	FP	--	--	--	--	--	--
			Oct-98	MW349-6	EAL, NRMRL	X	--	FP	--	--	--	--	--	--
Shaw AFB, SC	Building 1610	JP-4	Mar-97	MW-1610-2	NRMRL	X	X	FP / W	FP / W	FP / W	FP	2.5(8/96)	32.38	29-33
			Mar-97	MW-1610-2	EAL	X	--	FP	--	--	--	--	32.38	--
			Mar-97	MW-1610-3	NRMRL	X	X	FP / W	FP / W	FP / W	FP	--	--	--
			Mar-98	MW-1610-2	NRMRL	X	X	FP / W	FP / W	FP / W	FP	--	28.24	--
			Mar-98	MW-1610-3	NRMRL	X	X	FP / W	FP / W	FP / W	FP	--	--	--
			Mar-98	MW-1610-2	EAL	X	--	FP	--	--	--	--	28.24	--
Myrtle Beach AFB, SC	Pipeline Leak Site	JP-4	Mar-97	MW-8I	NRMRL	X	--	FP	FP	FP	FP	3.79(11/95)	--	2-8.5
			Mar-97	MW-8I	EAL	X	--	FP	--	--	--	--	3.7	--
			Mar-97	MW-24	NRMRL	X	--	FP	FP	FP	FP	--	--	--
DFSP-Charleston,	Tank 1 Area	JP-4	May-97	MW-103	NRMRL	X	--	FP	FP	FP	FP	1.77(5/96)	--	18-22
			May-97	EW6	NRMRL	X	--	FP	FP	FP	FP	--	15.92	--
			May-97	MW-103	EAL	X	--	FP	--	--	--	--	--	--
			May-97	EW6	EAL	X	--	FP	--	--	--	--	--	--
Eaker AFB, AR	Spill Site No. 2	JP-4	Aug-97	MW316	NRMRL	X	--	FP	FP	FP	FP	1.18(8/97)	--	8-14
			Aug-97	MW306	NRMRL	X	--	FP	FP	FP	FP	--	--	--
			Aug-97	MW316	EAL	X	--	FP	--	--	--	--	13.86	--
Beaufort MCAS, SC	Tank Farm C	JP-5	Aug-97	401-3	EAL	X	--	FP	--	--	--	--	--	--
Beaufort MCAS, SC			May-97	FBT-401-3	--	--	--	--	--	--	--	0.13(5/96)	6.98	2-8
Cecil Field NAS, FL	Day Tank 1, Facility 293	JP-5	May-97	CEF-293-9	--	--	--	--	--	--	--	0.78(8/96)	8.54	5-8
Seymour Johnson AFB, NC	Bldg 4522	JP-8	May-97	MW1S	NRMRL	X	X	FP / W	--	FP / W	FP	2.8(4/96)	5.08	4-9
			May-97	MW1S	EAL	X	--	FP	--	--	--	--	5.08	--
			Mar-98	MW1S	NRMRL	X	--	FP	FP	FP	FP	--	3.11	--
			Mar-98	MW1S	EAL	X	--	FP	--	--	--	--	3.11	--

TABLE 1 (Continued)
SUMMARY OF WELLS AND SITES SAMPLED
FUELS WEATHERING STUDY ADDENDUM

Base/Location	Site	Fuel Type	Date Sampled	Well Identification	Laboratory[a/]	Free Product	Water	BTEX[b/]	TMBs[b/]	Methyl-Naphthalenes	Density	LNAPL Thickness and Date (feet)	Depth to LNAPL (feet)	Depth to Water (feet)
Secondary Sites														
Wurtsmith AFB, MI	KC-135 Crash Site	JP-4	Aug-96	--	NRMRL	--	X	GW	--	--	--	0.22(3/91)	--	9-12
McChord AFB, WA	Washrack/Treatment Area	JP-4	Sep-97	--	NRMRL	X	--	FP	--	--	--	0.14(4/94)	--	11-15
Beaufort MCAS, SC	Day Tank 865	JP-5	May-97	--	NRMRL	X	--	FP	--	--	--	0.15(5/97)	--	2-8
Pope AFB, NC	JP-8 Release Site	JP-8	Jul-96	--	NRMRL	X	X	FP/GW	--	--	--	0.01(7/96)	--	6-9

[a/] EAL = Evergreen Analytical Services; NRMRL = National Risk Management Research Laboratory.

[b/] BTEX = benzene, toluene, ethylbenzene, and xylenes; TMBs = trimethylbenzenes.

TABLE 2
ANALYTICAL PROTOCOLS FOR
MOBILE LNAPL AND GROUNDWATER SAMPLES
FUELS WEATHERING STUDY ADDENDUM

SAMPLE MATRIX	NUMBER OF SAMPLES PER SITE	ANALYTES[a/]	METHOD
Mobile LNAPL	1 to 2	BTEX, Trimethylbenzenes, and Naphthalene	GC/MS (Direct Injection) by USEPA Method SW8260B
	1 to 2	BTEX and Naphthalene (Aqueous and Organic Phases)	Partitioning in accordance with Cline *et al.* (1991), by USEPA Method SW8021B
Groundwater	1 to 2	BTEX, Trimethylbenzenes, and Naphthalene	GC/MS (Direct Injection) by USEPA Method SW8260B

[a/] BTEX = benzene, toluene, ethylbenzene, and total xylenes.

TABLE 3
QUALITY ASSURANCE/QUALITY CONTROL SAMPLING PROGRAM
FUELS WEATHERING STUDY ADDENDUM

QA/QC Sample Types	Frequency to be Collected and/or Analyzed	Analytical Methods
Duplicates/Replicates	One groundwater and one LNAPL sample per every three sites (i.e., per mobilization)	Volatile Organic Compounds (VOCs)
Trip Blanks	None	
Matrix Spike/Matrix Spike Duplicate	One per every three sites (i.e., per mobilization)	VOCs
Laboratory Control Sample	Once per method per medium	Laboratory Control Charts (Method Specific)
Laboratory Method Blanks	Once per method per medium	Laboratory Control Charts (Method Specific)

ATTACHMENT A

DESCRIPTION OF WORK AND SCHEDULE FOR LABORATORY ANALYTICAL SERVICES

EXHIBIT A
DESCRIPTION OF WORK AND SCHEDULE

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EXHIBIT A
DESCRIPTION OF WORK AND SCHEDULE
FUELS WEATHERING STUDY

1.0 SERVICES TO BE PROVIDED

The SUBCONTRACTOR will provide laboratory analytical services for groundwater and free product samples to support a fuels weathering study conducted by Parsons Engineering Science, Inc. (Parsons ES) for the Technology Transfer Division, Air Force Center for Environmental Excellence (AFCEE/ERT). In addition, the SUBCONTRACTOR will prepare and analyze free product samples in accordance with Cline, *et al*. (1991) to provide fuel/water partition data. The reference (Cline, *et al*., 1991) is attached to this statement of work. The Cline procedure involves combining 2 milliliters (mL) of fuel with 40 mL of distilled, deionized, organic-free water, agitating the mixture for approximately 30 minutes, then allowing the sample to rest for 1 hour in an inverted position. Following mixing and stabilization, the aqueous phase and the organic (fuel) phase are analyzed separately.

Approximately 18 groundwater samples and 18 free product samples will be analyzed for volatile organic compounds (VOCs) by method SW8260B, plus field duplicates and matrix spikes. Approximately 18 additional free product samples will be provided to the lab for analyses using the Cline *et al*. (1991) method described above. The fuel and water phase of these samples will be analyzed for VOCs by method SW8021B. Table 1 lists the number of samples per method and the associated quality control (QC) samples. The target analyte list with reporting limits for VOCs is presented in Table 2.

The field effort will involve two separate sampling events. Approximately one third of the samples (6 groundwater samples, 6 free product samples, and 6 fuel/water partition samples) will be collected by the CONTRACTOR the week of April 11, 2001**.** The remaining half of the samples will be collected in the June to August 2001 time frame. The SUBCONTRACTOR period of performance is through October 1, 2001. A 14-day turn-around time for all results is required. Electronic data deliverables in the standard laboratory format are required for this project.

The SUBCONTRACTOR is expected to thoroughly review the technical specifications prescribed in this SOW. The SUBCONTRACTOR must identify in whole or part if the technical specifications requirements can be satisfied and documented by the SUBCONTRACTOR laboratory prior to issuance of a subcontract.

The work described in this subcontract is for compound-specific analytical services on groundwater and free product samples for method SW8260B and SW8021B. This SOW describes the analytical and reporting requirements that must be satisfied to meet the objectives of the project. All samples will be taken from environmental media only.

2.0 SITE SPECIFICATIONS

Specific details on the analytical methods, data quality requirements, reporting requirements, and scope of samples to be collected are provided in subsequent sections.

2.1 Laboratory Certification Requirements

The SUBCONTRACTOR providing analytical services for this SOW should provide certification for the States of South Carolina and North Carolina, if the SUBCONTACTOR has such certification. This certification is not required to perform this SOW.

2.2 Analytical Data Quality Levels

Data quality objectives (DQOs) for the analyses described herein are described in the interim final guidance, *Data Quality Objectives Process for Superfund* (1993; EPA 540-R-93-071). The analytical levels for this project's DQOs shall conform to the category of data defined as definitive data.

Definitive Data - Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, and digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined. Definitive data will be provided by the SUBCONTRACTOR to the CONTRACTOR.

Definitive analyses will be used to satisfy the requirements for decision-making regarding the comparison study or the need for further work. All analytical methods to be performed by the contract laboratory will be definitive analyses (see subsequent sections).

2.3 Quality Assurance Objectives

The overall quality assurance (QA) objectives must be appropriate to meet the specified DQOs. The quality assurance/quality control (QA/QC) program will provide the basic guidelines for evaluating the analytical results and field records for each site. Data quality assessments will be used to identify accurate and precise data that may be used in support of site closure. These QA objectives are qualitative summaries of qualitative and quantitative analyses requested for the site to ensure that the data are sufficient to support site characterization. QA/QC is ensured through appropriate sample collection, preservation, and transport methods combined with an evaluation of laboratory analytical performance through the analysis of QC samples.

An effective QA program addresses quality objectives for both sampling and laboratory methodologies. CONTRACTOR field QA efforts are aimed primarily at assuring that samples are representative of the conditions in the various environmental media at the time of sampling. Laboratory QA efforts are aimed primarily at assuring that analytical procedures provide sufficient accuracy and precision to quantify contaminant levels in environmental samples. The laboratory will also ensure that analyzed portions are representative of each sample, and that the results obtained from analysis of each sample are comparable to those obtained from analysis of other similar samples. Laboratory analyses provided by the SUBCONTRACTOR shall be performed in accordance with the analytical method specifications as defined in **Section 2.5**.

2.4 Data Quality Assessment Criteria

The data assessment criteria measure the quality of both the field and SUBCONTRACTOR laboratory performance for the project and are expressed in terms of analytical accuracy, precision, completeness, comparability, and representativeness. Procedures used to assess data accuracy and precision are in accordance with the respective analytical methods from the U.S. EPA Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update III, (1996).

2.4.1 Precision

Precision is the measure of variability between individual sample measurements under prescribed conditions. The results of relative percent difference (RPD) from the laboratory sample duplicate analyses and laboratory control sample (LCS) results demonstrate the precision of the methods. The RPD of field duplicate and matrix spike/matrix spike duplicates (MS/MSD) results demonstrate the precision of the sample matrix. Precision will be expressed in terms of RPD between the values resulting from duplicate analyses. RPD is calculated as follows:

$$RPD = [(x1 - x2)/X][100]$$

where:

x1	=	analyte concentration of first duplicate
x2	=	analyte concentration of second duplicate
X	=	average analyte concentration of duplicates 1 and 2.

Acceptable levels of precision will vary according to the sample matrix, the specific analytical method, and the analytical concentration relative to the method detection limit. For field duplicate samples, the target RPDs are 30 percent for soil and 20 percent for water samples. Precision for the SUBCONTRACTOR laboratory will be defined by historical limits developed through the use of control charts (reference Section 2.6.6). An RPD within the control limit indicates satisfactory precision in a measurement system.

2.4.2 Accuracy

Accuracy is a measure of the closeness of a reported concentration to the true value. Accuracy is expressed as a bias (high or low) and is determined by calculating percent recovery (PR) from MS/MSD, LCS, and surrogate spikes. MS/MSD and surrogate spike recoveries indicate accuracy relevant to a unique sample matrix. LCS recoveries indicate accuracy relevant to an analytical batch lot and are strictly a measure of analytical accuracy conditions independent of samples and matrices. The level of recovery of an analyte and the resulting degree of accuracy expected for the analysis of QC spiked samples are dependent upon the sample matrix, method of analysis, and the compound or element being measured. The concentration of the analyte relative to the detection limit of the method is also a major factor in determining the accuracy of the measurement.

Accuracy is expressed as PR and is calculated as follows:

$PR = [(A-B)/C] \times 100$

where:

A = spiked sample concentration

B = measured sample concentration (without spike)

C = concentration of spike added.

Accuracy for the SUBCONTRACTOR laboratory will be defined by historical limits developed through the use of control charts (reference Section 2.6.6). These limits should meet the minimum standards presented in Table 3.

2.4.3 Completeness

Completeness is defined as the percentage of laboratory measurements, judged to be valid measurements on a method, matrix, and compound basis. Valid data will be defined as all data considered to meet the DQOs for this project. Data completeness is expressed as percent complete (PC) and is 90 percent for soils and 95% for water. The goal for meeting technical holding times will be 100 percent. At the end of each sampling event, the completeness of the data will be assessed. If any data omissions are apparent, the parameter in question will be resampled and/or reanalyzed, if feasible, at the expense of the SUBCONTRACTOR laboratory. The SUBCONTRACTOR laboratory results will be monitored as they become available to assess SUBCONTRACTOR laboratory performance and its effect on data completeness requirements. When appropriate, additional samples will be collected to ensure that laboratory performance meets PC requirements.

PC is calculated as follows:

$$PC = \frac{NA}{NI} \times 100$$

Where:

NA = Actual number of valid analytical results obtained

NI = Theoretical number of results obtainable under ideal conditions.

2.4.4 Comparability

Comparability expresses the confidence with which data from a sample, sampling round, site, laboratory, or project can be compared to those from another. Comparability during sampling involves sampling program design and temporal factors. Comparability during analysis involves analytical methods, detection limits, the specific laboratory, units of measure, and sample preparation procedures.

The objective for comparability is determined on a qualitative rather than quantitative basis. For this project, comparability of all data collected will be ensured by adherence to standard sample collection procedures, standard field measurement procedures, and standard reporting methods including consistent units. For example, concentrations will be reported in a manner consistent with general practice (e.g., soil data will be reported on a dry-weight basis).

In addition, to support the comparability of analytical results with those obtained in previous or future testing, all samples will be analyzed by EPA-approved methods, where available. The EPA-recommended maximum permissible holding times for organic and inorganic parameters will not be exceeded. All analytical standards will be traceable to a “Standard Reference Material”. Instrument calibrations will be performed in accordance with EPA specifications, and will be checked at the frequency specified in the methods. The results of these analyses can then be compared with analyses by other labs and/or with analyses for other sites addressed by this site investigation.

2.4.5 Representativeness

Representativeness expresses the extent to which collected data define site contamination. Where appropriate, sample results will be statistically characterized to determine the degree to which the data accurately and precisely represent a characteristic of a population, parameter variation at a sampling point, a process, or an environmental condition.

Sample collection, handling, and analytical procedures will strive to obtain the most representative sample possible. Representative samples will be achieved by the following:

- Collection of samples from a location(s) fully representing site conditions;
- Use of appropriate sampling procedures, including equipment and equipment decontamination;
- Use of appropriate analytical methodologies for the required parameters and detection limits; and
- Analysis of samples within the required holding times.

Sample representativeness is also affected by the portion of each sample chosen for analysis. The SUBCONTRACTOR laboratory will adequately homogenize all samples prior to taking aliquots for analysis to ensure that the reported results are representative of the sample received. Because many homogenization techniques may cause loss of contaminants through volatilization, homogenization for all volatile method analyses will be performed with extreme care to minimize these risks.

2.5 Analytical Procedures

Application of a specific analytical method depends on the sample matrix and the analytes to be identified. Methods for each of the parameters likely to be included in the analytical program, as well as detection limits, are discussed in the following subsections. All analytical methods are EPA-approved when possible.

2.5.1 Analytical Methods

Analytical procedures will follow the established EPA methods wherever such methods exist for a specified analyte. The associated minimum matrix-specific project reporting limits (PRLs) required for this project are presented in Table 2. These methods are located in U. S. EPA Test Methods for Evaluating Solid Waste, Physical and Chemical Methods, SW846, 3rd Edition, Update III, (EPA, 1996). The analytical method for determining the partitioning coefficient is presented in attachment A.

Laboratory-specific historical control limits for LCSs, MS/MSDs and surrogate spikes, and current method detection limits for each target compound, provided by the SUBCONTRACTOR, will be compared to the reporting and control limits listed in Tables 2 and 3. Table 4 lists the applicable analytical holding times as well as sample container types and preservatives for all methods.

2.5.1.1 Gas Chromatography/Mass Spectrometry Volatile Compounds (SW8260B).

A 25-ml Method SW8260B will be performed to determine VOCs in the groundwater. In this method, a 25-ml aliquot of sample extract, spiked with appropriate surrogates and internal standards (ISs), is introduced into a purge-and-trap apparatus (Method SW5030A). Helium gas is then passed through the sample, stripping out the volatile analytes that are adsorbed onto a trap containing Tenax®, silica gel, or charcoal. The analytes are thermally desorbed into a gas chromatograph/mass spectrometer (GC/MS) system for separation and analysis. The GC is equipped with a capillary column for separation of the analytes. An MS is used for both semi-quantitative and quantitative analysis. The GC/MS is also equipped with a computer system for processing mass spectral data. A National Bureau of Standards (NBS) library of mass spectra is also available, to tentatively identify non-target compounds (tentatively identified compounds [TICs]).

2.5.1.2 Volatile Organic Compounds (SW8021B).

A 5-ml aliquot of aqueous sample is spiked with surrogates and introduced into the purge-and-trap sample preparation apparatus following partitioning (Attachment A) and/or method SW5030A. The GC is equipped with both a capillary column and a PID for the aromatic hydrocarbons.

2.5.2 Detection and Quantitation Limits

This section describes the terms, definitions, and formulas that will be used for detection and quantitation limits.

2.5.2.1 Instrument Detection Limit

The instrument detection limit (IDL) reflects the instrument operating efficiency, not sample preparation, or concentration/dilution factors. The IDL is operationally defined as three times the standard deviation of seven replicate analyses at the lowest concentration that is statistically different from a blank. This represents 99-percent confidence that the signal identified is the result of the presence of the analyte, not random noise.

2.5.2.2 Method Detection Limit

An MDL is the lowest concentration at which a specific analyte in a matrix can be measured and reported with 99-percent confidence that the analyte concentration is greater than zero. MDLs are experimentally determined and verified for each analyte of the analytical methods in the sampling program. MDLs are based on the results of spiking with a pure standard to achieve a concentration at the estimated detection limit and are statistically calculated in accordance with the 40 CFR part 136 from the Federal Register. This procedure specifies seven replicated standard injections to establish laboratory-specific MDLs for each analyte in each method.

The MDLs to be used are intended to allow that both nondetects and detects will be usable to the fullest extent possible for the project. The MDLs for each analytical method are required for all methods. The SUBCONTRACTOR laboratory will provide MDLs to the CONTRACTOR for each analyte listed for each analytical method at the time of project award. The SUBCONTRACTOR laboratory will be required to meet the MDLs as approved by the CONTRACTOR, on a routine basis during this project.

2.5.2.3 Sample Quantitation Limit

Sample quantitation limits (SQLs) are defined as the PRL multiplied by the dilution factor (DF) required to analyze the sample, and corrected for moisture or sample size. These adjustments may be due to matrix effects or the high concentration of some analytes. For example, if an analyte is present at a concentration that is greater than the linear range of the analytical method, the sample must be diluted for accurate quantitation. The DF raises the reporting limit to a higher level or SQL. Because the reported SQLs take into account sample characteristics and analytical adjustments, they are the most relevant quantitation limits for evaluating nondetected chemicals. Dilution factors will be held to the minimum required to analyze the sample. Target analytes will be diluted to the upper portion of the calibration curve. If multiple analytical runs are performed for a sample, the results of each analytical run will be reported on a Form 1.

2.5.2.4 Project Reporting Limit

For this project, the PRL is equivalent to the guidance listed in the AFCEE QAPP (March 1998). MDLs must be lower (where practical) than the reporting limits listed in Table 2.

All analytical results for total soils (if any) will be reported on a dry weight basis (i.e., corrected for moisture content). Additionally, the moisture content for each soil sample will be reported as part of the reporting requirements. The equation for moisture content given in ASTM D-2216 will be modified as follows:

W = [(W1-W2)/W1-Wc)] X 100

where W = moisture content, percent by weight

W1 = weight of container and sample as received

W2 = weight of container and oven-dried sample

Wc = weight of container

2.5.2.5 Reporting Units

The following are the prescribed analytical reporting units for all analytical methods (if applicable).

- Free product and soil samples - organics: micrograms per kilogram (µg/kg), dry-weight basis;

- Free product and soil samples - inorganics/metals: milligrams per kilogram (mg/kg), dry-weight basis;
- Water (rinseate and/or groundwater) samples - inorganics and metals: milligrams per liter (mg/L); and
- Water (rinseate and/or groundwater) samples - organics: micrograms per liter (µg/L).

2.6 Laboratory Internal QC Checks

SUBCONTRACTOR laboratory QC data are necessary to determine precision and accuracy of the analyses and to demonstrate the absence of interferences and contamination of glassware and reagents. QC samples will be analyzed routinely by the analytical SUBCONTRACTOR laboratory as part of the laboratory QC procedures. SUBCONTRACTOR laboratory QC results will consist of analysis of blanks, replicates, standards, MS/MSDs, LCSs, and surrogate spikes as specified in the methods. Results of these analyses will be reported with the sample data and kept in the project QC data file.

2.6.1 Method Blanks

Method blanks are designed to detect contamination of the environmental samples in the SUBCONTRACTOR laboratory. Method blanks verify that method interferences caused by contaminants in solvents, reagents, glassware, or in other sample processing hardware are known and minimized. The method blank will be deionized, distilled water for water samples, or a purified solid matrix for soil/sediment samples. The concentration of target compounds in the blanks must be less than or equal to the PRL. Exception is NOT made for common laboratory contaminants. If the blank is not under the specified limits, then the source of contamination will be identified and corrective action taken, including reanalysis of the sample group. Sample quantitation and detection limits will not be raised because of blank contamination. Analytical data will not be corrected for presence of analytes in blanks.

2.6.2 Laboratory Control Samples

LCSs are blank spikes made from clean laboratory simulated matrices (laboratory water or purified solid matrix), spiked with known concentrations of all target analytes of interest at levels approximately 10 times greater than the MDL. Blank spikes are designed to check the accuracy of the preparation and analysis procedures of the laboratory. An LCS will be analyzed with every analytical batch. Failure of the LCS to meet recovery criteria requires corrective action before any further analyses can continue. If the SUBCONTRACTOR analyzes more than one LCS with an analytical batch, both sets of results must be reported. Both LCSs must be within control limits or corrective action must be taken. The laboratory will provide lab-established recovery criteria for each method to the CONTRACTOR for review and acceptance within two (2) weeks of contract acceptance.

2.6.3 Surrogate Spike Analyses

Surrogate spike analyses are used to determine the efficiency of analyte recovery in sample preparation and analysis in relation to sample matrix. Calculated percentage recovery of the spike is used to measure the accuracy of the analytical method for an individual sample. A surrogate spike is prepared by adding to an environmental sample (before extraction) a known amount of a pure compound similar in type to the target analytes to be analyzed for organic target compounds. Surrogate compounds as specified in the methods will be added to all samples analyzed, including method blanks, MS/MSDs, LCSs, environmental samples, and duplicate samples. Surrogate spike recoveries should fall within the historical limits established by laboratory QC protocol. The laboratory will provide historical surrogate spike recovery limits to the CONTRACTOR within two (2) weeks of acceptance of contract. If a recovery is not within the accepted limits, the corrective actions described in the method will be implemented.

2.6.4 Matrix Spike/Matrix Spike Duplicate

MS samples are designed to check the accuracy of the analytical procedures on sample matrix by analyzing an environmental sample spiked in the SUBCONTRACTOR laboratory with a known standard solution containing all the target analytes. MSDs are the second of a pair of laboratory MS samples. The MSDs are designed to check the precision and accuracy of analytical procedures by sample matrix.

One MS/MSD pair will be collected for every group of 20 samples. Field blanks or duplicates will not be identified by the CONTRACTOR for MS/MSDs. Field-selected samples will be used as MS/MSDs. The laboratory must provide historical limits established for MS/MSDs for each method within two (2) weeks of contract acceptance. If surrogate and target analyte compounds fail in the MS/MSD, but show that accuracy is in control in the LCS, then a re-extraction and reanalysis will not be required for any samples in the batch and the out-of-control situation will be attributed to a matrix interference. If the SUBCONTRACTOR laboratory system is shown to be out of control, then a re-extraction and reanalysis will be required. The SUBCONTRACTOR laboratory will report the data from any reanalysis that is performed.

2.6.5 Analytical Batches

Analytical batches will be designated in the SUBCONTRACTOR laboratory at a minimum of one batch per sample delivery group (SDG). Each SDG will be comprised of a maximum of 20 samples of similar matrix and collected within a 7-day period. Included in each SDG of 20 (or fewer) samples per analytical method will be one field duplicate or replicate, MS/MSDs, LCSs, and depending on the matrix, the associated trip, and/or equipment rinseate blanks. One sample from each SDG will be designated for MS/MSD by the field team leader to assure that a field blank is not spiked.

2.6.6 Control Limits

The acceptance criteria for the control limits associated with all methods will follow guidance established in the SW846 methods and the SUBCONTRACTOR laboratory's historical data. These control limits must meet the minimum requirements for the control limits listed in Table 3 or a variance must be requested. The SUBCONTRACTOR laboratory must specify historical control limits for MS/MSDs, LCSs, and surrogate spikes for each analytical method. These limits must be provided by the laboratory to the CONTRACTOR within two (2) weeks of contract acceptance. Each SUBCONTRACTOR laboratory reviews and evaluates QC data through the use of method specific control charts. At least 20 measurements are required before control limits can be established. Warning limits, when established, are set at two standard deviations above and below the mean standard recovery and are used by the laboratory as an indicator of potential impending analytical problems. Upper and lower control limits are defined as 3 standard deviations above or below the mean standard recovery respectively and are used to qualify data accordingly on the basis of out of control criteria.

3.0 SAMPLE CONTAINERS

The SUBCONTRACTOR shall provide sample containers (as requested), labels, any necessary preservatives, chain of custody forms, and coolers to the project site. It is important to use properly cleaned sample containers so that no chemical alteration of results from contact with the sample container. The SUBCONTRACTOR shall provide documentation attesting to the cleanliness of the containers following their cleaning procedures. A certificate of cleanliness will be provided for any commercially purchased sample containers.

The CONTRACTOR will notify the SUBCONTRACTOR laboratory two (2) working days in advance of sample collection to confirm initiation of the project and to determine sample container requirements. Sample containers will be sent to the project site at the expense of the SUBCONTRACTOR. In the event the SUBCONTRACTOR has not received proper notification time in order to provide sample containers to the site through standard United Parcel Service delivery, the CONTRACTOR will pay the cost of Federal Express shipping. The SUBCONTRACTOR is responsible to notify the CONTRACTOR in advance of express shipping to allow the CONTRACTOR to provide an account number for express shipping charges.

4.0 SAMPLE CUSTODY REQUIREMENTS

The CONTRACTOR’s project task manager or QA officer will notify the SUBCONTRACTOR laboratory project coordinator of anticipated field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival. An analytical batch will consist of environmental samples plus a matrix spike and matrix spike duplicate analysis, which have been assigned the same lot control numbers. The field team leader will ensure that laboratory holding times will not be jeopardized.

To facilitate sample preparation and analysis within the specified holding times, the laboratory will track the progress of sample preparation, analysis, and report preparation. Samples received by the laboratory will be checked carefully for label identification, COC, and any discrepancies. The laboratory will also note physical damage, incomplete sample labels, incomplete paperwork, discrepancies between sample labels and paperwork, broken or leaking containers, and inappropriate caps or bottles. The temperature and pH of samples will be determined and recorded as appropriate. The laboratory sample custodian will notify the CONTRACTOR’s project task manager of any problems observed with any of the samples received. The laboratory sample custodian will also provide a written report to the project task manager summarizing the condition of samples, sample numbers received, corresponding laboratory numbers, and the estimated date for completion of analysis. The subcontract laboratory must receive written permission before sending any samples (originally scheduled to be analyzed at their facility) to another laboratory. Permission need only be obtained once if the laboratory subcontracts out some methods. Tests will not be performed on samples whose integrity have been compromised or are suspect.

5.0 SAMPLE HANDLING

Laboratory sample custody will be maintained by the following procedure:

1. The laboratory will designate a sample custodian responsible for maintaining custody of the samples and all associated paperwork documenting that custody.

2. Upon receipt of the samples, the sample custodian will sign the original COC form and compare the analyses requested thereon with the tag on each sample container.

3. A qualitative assessment of each sample container will be performed to note any anomalies such as broken or leaking bottles, or lack of preservation (e.g., ice melted en route). This assessment will be recorded as part of the incoming COC procedure.

4. If all data and samples are correct, and there has been no tampering with the custody seals, the "received by laboratory" box on the COC form will be signed and dated.

5. Care will be exercised to document any labeling or descriptive errors. In the event of discrepant documentation, breakage, or conditions that could compromise the validity of analyses, the laboratory project coordinator will immediately contact the task manager as part of the corrective action process.

6. Samples will be logged into the laboratory management computer system, which includes a tracking system for extraction and analysis dates. The laboratory will assign a laboratory work number to each sample for identification purposes. The sample custodian will log the laboratory work number and the field sample identification into a laboratory sample custody log. The laboratory sample custody log may either be hard copy or computerized, depending on the laboratory's system.

7. The samples will be stored in a secured area at a temperature of approximately 4±2 degrees Celsius (°C) or cooler (as applicable) until analyses commence. The laboratory log should also contain the laboratory storage cooler number (if applicable) that the sample will be stored in while on the laboratory's premises. Samples will be logged when they are removed and returned from storage for analysis. Samples must be stored in separate coolers from those used to store analytical standards, reagents and/or QC samples.

8. The samples will be distributed to the appropriate analysts, with names of individuals who receive samples recorded in internal laboratory records.

9. The original COC form will accompany the laboratory report submittal and will become a permanent part of the project records.

10. Data generated from the analysis of samples must also be kept under proper custody by the laboratory.

For data that are input by an analyst and processed using a computer, a copy of the input will be kept and identified with the project number and other information as needed. If the data are directly acquired from instrumentation and processed, a permanent copy of the instrument electronic data will be archived.

Upon analysis, a laboratory lot control number will be assigned to the sample. All samples within a given laboratory analysis group (e.g., samples sharing the same laboratory QC measurement samples) will have identical laboratory lot control numbers.

Disposal of sample containers and remaining sample material shall be the responsibility of the SUBCONTRACTOR. Samples should be disposed of appropriately when all analyses and related QA/QC work are completed. See Section 12 for further details.

6.0 SAMPLE IDENTIFICATION AND SAMPLE CUSTODY RECORDS

The laboratory conducting the analysis of the samples will provide the data user with information on the laboratory sample identification system. With knowledge of this laboratory sample identification system, data generated at the laboratory can be tracked by both the laboratory and field sample identification systems.

Each sample will be logged into the laboratory system by assigning it a unique sample number. This laboratory number and the field sample identification number will be recorded on the laboratory report.

7.0 CORRECTIVE ACTION

The following procedures have been established to assure that conditions adverse to data quality are promptly investigated, evaluated, and corrected. Adverse conditions may include malfunctions, deficiencies, deviations, and errors.

When a significant condition adverse to data quality is noted at the laboratory, the cause of the condition will be determined, and corrective action will be taken to prevent repetition. Condition identification, cause, reference documents, and corrective action planned will be documented and reported to the contractor QA officer by the laboratory QC coordinator. Following implementation of corrective action, the laboratory QC coordinator will report the actions taken and their results to the contractor project manager and QA officer. A record of the action taken and results will be attached to the data report package. If samples are reanalyzed, the assessment procedures will be repeated, and the control limits will be reevaluated to ascertain if corrective actions have been successful.

Implementation of corrective action is verified by documented follow-up action. All project personnel have the responsibility, as part of the normal work duties, to identify, report, and solicit approval of corrective actions for conditions adverse to data quality.

Corrective actions will be initiated in the following instances:

- When predetermined acceptance criteria are not attained (objectives for precision, accuracy, and completeness);
- When the prescribed procedure or any data compiled are faulty;
- When equipment or instrumentation is determined to be faulty;
- When the traceability of samples, standards, or analysis results is questionable;

- When QA requirements have been violated;
- When designated approvals have been circumvented;
- As a result of systems or performance audits;
- As a result of regular management assessments;
- As a result of intralaboratory or interlaboratory comparison studies; and
- At any other instance of conditions significantly adverse to quality.

Laboratory project management and staff, such as QA auditors, document and sample control personnel, and laboratory groups, will monitor work performance in the normal course of daily responsibilities.

The laboratory QC coordinator or designated alternate will audit work at the laboratory. Items, activities, or documents ascertained to be compliant with QA requirements will be documented, and corrective actions will be mandated in the audit report. The contractor QA officer and laboratory QC coordinator will log, maintain, and control the audit findings.

The CONTRACTOR QA officer and laboratory QC coordinators are responsible for documenting all out-of-control events or non-conformance with QA protocols. A nonconformance report will summarize each nonconformance condition. The laboratory will notify the contractor project manager or QA officer of any laboratory QA/QC nonconformances upon their discovery. Copies of all field change requests and corrective action forms will be maintained in the project files. A stop-work order may be initiated by the contractor if corrective actions are insufficient.

8.0 QUALITY ASSURANCE REPORTS

At monthly intervals beginning with the initiation of sampling activities, the SUBCONTRACTOR laboratory will submit to the project QA officer an internal QA report that documents laboratory-related QA/QC issues. These reports will include discussions of any conditions adverse or potentially adverse to quality, such as:

- Responses to the findings of any internal or external systems or performance laboratory audits;
- Any laboratory or sample conditions which necessitate a departure from the methods or procedures specified in this QAPP;
- Any missed holding times or problems with laboratory QC acceptance criteria; and
- The associated corrective actions taken.

QA reports will not prevent notification of project management of such problems when timely notice can reduce the loss or potential loss of quality, time, effort, or expense. Appropriate steps will be taken to correct any QA/QC concerns as they are identified. The project manager will ensure that the client is informed of any significant QA/QC developments. These reports and a summary of the laboratory QA/QC program and results will be included in the final project report.

9.0 DATA REVIEW PROCEDURES

The laboratory review of definitive data is a four-step process involving an evaluation by the analyst, a peer review, an administrative review, and a QA review. A checklist to document each of the review processes will be required and must be included as part of the final data deliverable. All steps are described below.

The analyst will review 100 percent of all definitive data prior to reporting. The establishment of detection and control limit will be verified. Any control limit outside of the acceptable ranges specified in the analytical methods will be identified. Any trends or problems with the data will be evaluated. The absence of records supporting the establishment of control criteria or detection limit laboratory will be noted. Analytical batch QC, calibration check samples, initial and continuing calibrations, corrective action reports, the results of reanalysis, sample holding times, and sample preservations will be evaluated.

Samples associated with out-of-control QC data will be identified in the data package case narrative, and an assessment of the utility of such analytical results will be made. The check of laboratory data completeness must be documented and will ensure that:

- All samples and analyses specified in the COC have been processed;
- Complete records exist for each analysis and the associated QC samples; and
- Procedures specified in this QAPP have been implemented.

An analyst other than the original data processor will be responsible for performing a peer review of all steps of the data processing. One hundred percent of all data will be reviewed. All input parameters, calibrations, and transcriptions will be checked. All manually input, computer-processed data will be checked. Each page of checked data will be signed and dated by the verifier.

QC sample results (LCSs and initial and continuing calibration standards) are compared against stated criteria for accuracy and precision. QC data must meet acceptance levels prior to processing the analytical data. If QC standards are not met, the cause will be determined. If the cause can be corrected without affecting the integrity of the analytical data, processing of the data will proceed. If the resolution jeopardizes the integrity of the data, reanalysis will occur.

An administrative review will be performed by the laboratory project manager on each data deliverable package. The review will ensure that all requirements of the laboratory and the data deliverable have been met and are complete.

A review of at least 10 percent of all data deliverable packages by a laboratory QA officer must take place prior to the administrative review and final release of the data deliverable. The data packages will be randomly selected for review.

Decisions to repeat sample collection and analyses may be made by the project manager based on the extent of the deficiencies and their importance in the overall context of the project.

10.0 DATA DELIVERABLES

The SUBCONTRACTOR laboratory will be required to deliver all final data packages to the CONTRACTOR in both computerized and hard copy formats. EPA qualifiers will be applied to the data. All applicable qualifiers will be reported on the sample reporting forms. Compositing of the qualifiers is not requested. To facilitate data handling and management, both field and SUBCONTRACTOR laboratory data will be entered into a computerized format. All data will be maintained by the CONTRACTOR in an ACCESS database. Required laboratory deliverables are listed on Table 5. If multiple analytical runs are performed for a sample, the results of each analytical run will be reported on a Form 1.

All data entered into the electronic data files will correspond to the data contained in the original SUBCONTRACTOR laboratory reports and other documents associated with sampling and the SUBCONTRACTOR laboratory hardcopy data deliverable packages. To assure the accuracy of all entries into the database, all entries also will be checked by the CONTRACTOR against the submitted hardcopy reports. Any deviations between reports, errors, or other problems will prompt the CONTRACTOR to return the entire reporting package (both hard copy and electronic) to the SUBCONTRACTOR laboratory for corrective action.

Additionally, the SUBCONTRACTOR will be required to provide two (2) copies of each hard copy data reporting package. All analytical data packages will be verified prior to being released by the SUBCONTRACTOR laboratory**. The data deliverables are required a maximum of 14 days from sample receipt**. On the day of receipt of samples from the CONTRACTOR, the SUBCONTRACTOR will fax signed copies of all COCs and sample login receipt forms. All discrepancies and/or potential problems (i.e.; lack of sample volume) will be discussed immediately with the CONTRACTOR's QA manager.

Finally, the SUBCONTRACTOR laboratory will hold, and make available upon request, all project raw data for a minimum period of 10 years after the samples have been analyzed.

11.0 PERFORMANCE AND SYSTEM AUDITS

This section describes participation in external and internal systems and performance audits for laboratory work.

System audits review laboratory operations and the resulting documentation. An onsite audit ensures that the laboratory has all the personnel, equipment, and internal standard operating procedures needed for performance of contract requirements, in place and operating. The system audits ensure that proper analysis documentation procedures are followed, that routine laboratory QC samples are analyzed, and that any nonconformances are identified and resolved.

11.1 Internal Audits

The SUBCONTRACTOR laboratory must conduct internal system audits on a periodic basis. The results of these audits will be documented by the laboratory QC coordinator, and the laboratory will provide CONTRACTOR with the results of these internal audits.

11.2 External Audits

The CONTRACTOR project QA officer or designee may conduct an external system audit of the laboratory during the performance of this project. This audit would evaluate the capabilities and performance of project and SUBCONTRACTOR personnel, items, activities, and documentation of the measurement systems and identify and correct any deficiencies. The QA manager may request additional personnel with specific expertise from other project groups to assist in conducting performance audits. However, these personnel will not have participated in, nor have responsibility for, the direct work associated with the performance audit. The CONTRACTOR QA manager acts on audit results by documenting deficiencies and informing the project manager of the need for corrective actions. The project manager may suspend operations until problems are resolved. If conditions adverse to quality are detected, or if the project manager requests additional audits, the project QA officer may conduct additional unscheduled audits.

11.3 Performance Audits

Performance audits may be conducted to determine the accuracy and implementation of the SOW by the CONTRACTOR QA manager or designee prior to initiation of field sampling. Unplanned audits may be implemented if requested by the task manager. In addition to in-house performance audits, the laboratory may also participate in interlaboratory performance evaluation studies. The CONTRACTOR QA/QC manager will report audit findings to the project manager. The project manager will act to correct any laboratory performance problems.

11.4 System Audits

System audits, performed by the CONTRACTOR QA/QC manager or designee, will encompass evaluation of QA components to ascertain their appropriate selection and application. In addition, field and laboratory QC procedures and associated documentation may be system audited. System audits are not planned for this project but will be conducted if adverse quality conditions are observed. In addition, if the project manager requests the QA/QC manager to perform unscheduled audits, these activities will be instituted.

12.0 FINAL SAMPLE DISPOSITION

Upon completion of all required analyses and acceptance of the data reported by the CONTRACTOR, the SUBCONTRACTOR shall be responsible for proper disposal of any remaining samples, sample containers, shipping containers, and Styrofoam or plastic packing materials in accordance with sound environmental practice, based on the sample analytical results. Unused samples and containers found to be non-hazardous will be disposed of after sixty (60) days following completion of the analysis unless the CONTRACTOR requests the storage of the sample (fee applied). However, the SUBCONTRACTOR shall give prior notification to and receive the approval of the CONTRACTOR before disposing of any remaining samples. The SUBCONTRACTOR shall maintain proper records of waste disposal methods, and shall have disposal company contracts on file for inspection. The SUBCONTRACTOR will not charge for the above sample disposal.

13.0 SCHEDULE AND LIQUIDATED DAMAGES

Sampling is anticipated to begin on or about April 9, 2001 and will be completed by July 2001.

13.1 Resampling Cost

Reported analytical results that do not meet the criteria in this SOW shall be resampled and/or reanalyzed at no cost to the CONTRACTOR if these results are from negligent performance of the SUBCONTRACTOR. The SUBCONTRACTOR shall also pay the CONTRACTOR the documented costs of resampling as a result of SUBCONTRACTOR exceeding holding times or losing samples.

13.2 Liquidated Damages

SUBCONTRACTOR and CONTRACTOR agree that the actual damages and losses which CONTRACTOR would incur as a result of the SUBCONTRACTOR's failure to complete analyses within the required reporting period would be difficult to precisely determine. CONTRACTOR and SUBCONTRACTOR further agree that a sum of 5% of the total cost of the individual analysis per Day ("Day" shall mean a calendar day) is a reasonable and fair estimate of the damages and losses which the CONTRACTOR would suffer for each Day by which the SUBCONTRACTOR is late in completing an analysis within the required reporting period. It is therefore agreed that the SUBCONTRACTOR shall pay to the CONTRACTOR the sum of 5% of the total cost of the individual analysis as liquidated damages, and not as a penalty, for each Day by which the SUBCONTRACTOR is late in completing an analysis within the required reporting period. Such liquidated damages shall be assessed separately for each sample for which SUBCONTRACTOR is late in completing an analysis within the required reporting period.

The CONTRACTOR will identify any missing or incorrect deliverables (hardcopy or electronic) by filing a resubmission request to the SUBCONTRACTOR laboratory specifying corrective action. The SUBCONTRACTOR laboratory will submit a revised, corrected deliverable within 2 weeks of notification of a rejected report or the five percent (5%) per day liquidated damages will be imposed. If the resubmitted deliverable does not satisfactorily resolve the problem, then the five percent (5%) per day liquidated damages will be imposed from the date of follow-up notification to the SUBCONTRACTOR for additional required deliverables. Any additional costs incurred by the SUBCONTRACTOR for preparation and submittal of revised reports to correct errors or omissions are not reimbursable.

14.0 SERVICES TO BE PERFORMED AT LABORATORIES OTHER THAN SUBCONTRACTOR'S

The SUBCONTRACTOR will assume responsibility for providing all analytical services specified in this subcontract. Should it be agreed in writing that the SUBCONTRACTOR may use an additional laboratory facility, the SUBCONTRACTOR will supply to the CONTRACTOR the SOPs, MDL studies, QC criteria, and QA plans for the other laboratories that are used. The SUBCONTRACTOR shall be responsible for communicating all analytical guidelines and QC requirements of the project to these laboratories. The SUBCONTRACTOR'S and the CONTRACTOR's QA officers shall monitor the data from these laboratories and correct any nonconformances.

15.0 REFERENCES

Cline, P.V., J.J. Delfino, and P.S. Rao. 1991. Partitioning of Aromatic Constituents into Water from Residually Held NAPL in Unsaturated Soil Columns. Journal of Contaminant Hydrology, 25, 914-920.

U.S. Environmental Protection Agency (USEPA). 1983. *Methods for the Chemical Analysis of Water and Wastes.* EPA 600/4-79-020. Cincinnati, OH.

EPA. 1993. *Data Quality Objectives Process for Superfund. USEPA 540-R-93-071.*

EPA. 1995a. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW846,* (3rd Edition, Update III). United States Environmental Protection Agency (USEPA). 1995a. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW846,* (3rd Edition, Update III).

TABLE 1
SAMPLES AND QUALITY CONTROL SAMPLES PER ANALYTICAL METHOD
FUELS WEATHERING STUDY

Method	# Samples	Trip Blanks	MS/MSD Pairs	Field Duplicates	Total
Free Product:					
SW8260B	18	0	2	2	24
Cline, *et al.*, 1991 /SW8021B	18	0	2	2	24
Groundwater:					
SW8260B	18	0	2	2	24
Cline, *et al.*, 1991 /SW8021B	18	0	2	2	24

TABLE 2

REPORTING LIMITS FOR TARGET ANALYTES

FUELS WEATHERING STUDY

		Water	
Parameter/Method	**Analyte**	**RL**	**Unit**
SW8021B	1-Methylnaphthalene	0.6	µg/L
	2-Methylnaphthalene	0.6	µg/L
	1,2,3-Trimethylbenzene	0.5	µg/L
	1,2,4-Trimethylbenzene	0.5	µg/L
	1,3,5-Trimethylbenzene	0.10	µg/L
	Benzene	0.10	µg/L
	Ethylbenzene	0.50	µg/L
	m-Xylene	0.10	µg/L
	Naphthalene	0.60	µg/L
	o-Xylene	0.20	µg/L
	p-Xylene	0.10	µg/L
	Toluene	0.10	µg/L
	Xylenes, Total	0.50	µg/L
SW8260B	1,2,3-Trimethylbenzene	1.3	µg/L
	1,2,4-Trimethylbenzene	1.3	µg/L
	1,3,5-Trimethylbenzene	0.5	µg/L
	1-Methylnaphthalene	0.4	µg/L
	2-Methylnaphthalene	0.4	µg/L
	Benzene	0.4	µg/L
	Ethylbenzene	0.6	µg/L
	m-Xylene	0.5	µg/L
	Naphthalene	0.4	µg/L
	o-Xylene	1.1	µg/L
	p-Xylene	1.3	µg/L
	Xylenes, total		µg/L
	Toluene	1.1	µg/L

TABLE 3
QC ACCEPTANCE CRITERIA
FUELS WEATHERING STUDY

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)
SW8260B	1,2,3-Trimethylbenzene	75-125	≤ 20
	1,2,4-Trimethylbenzene	75-125	≤ 20
	1,3,5-Trimethylbenzene	72–112	≤ 20
	1-Methylnaphthalene	75-125	≤ 20
	2-Methylnaphthalene	75-125	≤ 20
	Benzene	75–125	≤ 20
	Ethylbenzene	75–125	≤ 20
	m-Xylene	75–125	≤ 20
	Xylenes, Total	75–125	≤ 20
	Naphthalene	75–125	≤ 20
	o-Xylene	75–125	≤ 20
	p-Xylene	75–125	≤ 20
	Toluene	74–125	≤ 20
	Surrogates:		
	Dibromofluoromethane	75–125	
	Toluene-D8	75–125	
	4-Bromofluorobenzene	75–125	
	1,2-DCA-D4	62–139	
	Internal Standards:		
	Fluorobenzene		
	Chlorobenzene-D5		
	1,4-Dichlorobenzend-D		
SW8021B	1-Methylnaphthalene	65-135	≤ 20
	2-Methylnaphthalene	65-135	≤ 20
	1,2,3-Trimethylbenzene	65-135	≤ 20
	1,2,4-Trimethylbenzene	65-135	≤ 20
	1,3,5-Trimethylbenzene	65-135	≤ 20
	Benzene	75–125	≤ 20
	Ethylbenzene	71–129	≤ 20
	m-Xylene	65-135	≤ 20
	Naphthalene	65-135	≤ 20
	o-Xylene	65-135	≤ 20
	p-Xylene	65-135	≤ 20
	Toluene	70–125	≤ 20
	Xylenes, Total	71–133	≤ 20
	Surrogates:		
	1,4-Dichlorobutane	35–135	
	Bromochlorobenzene	37–137	

TABLE 4
REQUIREMENTS FOR CONTAINERS, PRESERVATION TECHNIQUES, SAMPLE VOLUMES, AND HOLDING TIMES
FUELS WEATHERING STUDY

Name	Analytical Methods	Container	Preservation	Minimum Sample Volume or Weight	Maximum Holding Time
Volatile Organics	SW8260B/SW8021B	G, Teflon®-lined septum, T (water); En Core Sampler for soils	4^oC, 0.008% $Na_2S_2O_3$ (HCl to pH < 2 for volatile aromatics by SW8260) (preservation with 0.008 percent $Na_2S_2O_3$ is only required when residual chlorine is present) 4^oC (soil) $Na_2S_2O_3$	3 x 40 ml or 4 ounces or 3 En Core Samplers	14 days (water and Soil); 48 hours until preservation of En Core Samplers

a/ No pH adjustment for soil.

b/ Preservation with 0.008 percent $Na_2S_2O_3$ is only required when residual chlorine is present.

Acronyms:

G – Glass HCl – Hydrochloric acid $Na_2S_2O_3$ – Sodium thiosulfate T - brass sleeves in the sample barrel

TABLE 5

REQUIRED LABORATORY DELIVERABLES
FUELS WEATHERING STUDY

Method Requirements	Laboratory Deliverables (Definitive Data)
Requirements for all methods:	
Case narrative	Project identification. Analytical method description and reference citation. Discussion of unusual circumstances, problems, and nonconformances.*
Monthly QA report	Any format to discuss issues which may affect data quality *
Chain of Custody (COC)	Signed and dated when samples were* received at laboratory
Dates of sample preparation and analysis (including first run and subsequent runs).	Specific deliverable depends upon type of analysis.*
Quantitation limits achieved.	Specific deliverable depends upon type of analysis.*
Dilution or concentration factors.	Specific deliverable depends upon type of analysis.*
Matrix spike/matrix spike duplicate.	Summary information only *
Method blank analysis.	Summary information only *
Laboratory control sample	Summary information only *
Summary analytical batch report	Any format* including analytical batch samples, method of analysis, matrix description, date of sample collection and receipt, laboratory identification number of each environmental sample plus identification number of each batch QC sample (including MS/MSD, calibration check, etc.).
Example sample calculation	Any format
A copy of the sample preparation data form for each method indicating sample identification number, batch identification number, and date of preparation.	Any format (preparation, extraction, or digestion data)
Percent moisture for all soil samples	Any format on data summary sheet *
Method reporting limits.	QC summary report*
QC limits.	QC summary report*
PQL verification standard (weekly).	Any format

TABLE 5 (Continued)
REQUIRED LABORATORY DELIVERABLES
FUELS WEATHERING STUDY

Method Requirements	**Laboratory Deliverables (Definitive Data)**
Requirements for organics:	
Sample data sheets.	Summary information only [a/]*
Surrogate recoveries.	Summary information only [a/]*
GC/MS instrument performance check	Summary information only *
Initial calibration data	Summary information only
Continuing calibration data.	Summary information only
Calibration blank data	Summary information only
GC/MS internal standard area and retention time summary data.	Summary information only
Analysis run log.	No format
Requirements for inorganic analytical methods Metals:	
Sample data sheets	Summary information only *
Initial and continuing calibration	Summary information only
Method blank, taken through sample preparation	Summary information only
Calibration blank data	Summary information only
Interference check sample	Summary information only
Laboratory control spike/laboratory control spike duplicate	Summary information only
Matrix spike/matrix spike duplicate	Summary information only
Post-digestion spike sample recovery	Summary information only
Method of standard additions	Summary information only
Serial dilutions	Summary information only
Analysis run logs	Any format

* Indicates deliverables required for QC summary package.

a/ Summarized results can be in any format that provides the necessary data to completely validate that QC parameter. Example formats are the form equivalents to those defined for the CLP or SW-846

APPENDIX B

O'BRIEN AND GERE ANALYTICAL DATA

Analytical Data available upon request from:

Parsons

c/o Dan Griffiths

1700 Broadway, Suite 900

Denver, Colorado 80290

APPENDIX C

CALCULATIONS

APPENDIX C-1

MOBILE LNAPL
WEATHERING CALCULATIONS

								Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	Benzene	0.29412	0.2059	0.0745	14.90	0.1920	17.47	0.2171	0.0785	15.36	0.2000	18.13
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	Toluene	0.63922	0.6908	0.2499	18.79	0.2650	23.28	1.0815	0.3912	22.74	0.3582	30.11
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	Ethylbenzene	0.17516	0.1948	0.0705	19.05	0.2705	23.70	0.5817	0.2104	27.80	0.5294	41.10
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	Total Xylenes (m,p, and o)	1.11503	1.2050	0.4359	18.79	0.2650	23.28	1.2453	0.4505	19.09	0.2713	23.76
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	Total BTEX	2.22353	2.2965	0.8307	18.38	0.2566	22.63	3.1256	1.1307	21.14	0.3176	27.21
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	1,2,3-Trimethylbenzene	0.39085	-0.3908	-0.1414	#DIV/0!	#DIV/0!	#DIV/0!	0.0593	0.0214	4.76	0.0511	4.98
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	1,2,4-Trimethylbenzene	0.75686	0.2531	0.0916	9.07	0.1044	9.91	0.0598	0.0216	2.65	0.0275	2.72
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	1,3,5-Trimethylbenzene	0.45098	-0.0310	-0.0112	-2.67	-0.0257	-2.61	-0.3292	-0.1191	-97.74	-0.4735	-60.56
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	Naphthalene	0.14641	0.3536	0.1279	25.58	0.4443	35.87	0.1279	0.0463	16.87	0.2271	20.32
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	1-MethylNaphthalene	0.13595	0.6441	0.2330	29.87	0.6320	46.85	-0.0998	-0.0361	-99.83	-0.4791	-61.46
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	2-MethylNaphthalene	0.21961	0.3404	0.1231	21.99	0.3386	28.73	-0.0613	-0.0222	-13.99	-0.1183	-12.56
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-2	Total Naphthalenes	0.50196	1.3380	0.4840	26.31	0.4699	37.49	-0.0331	-0.0120	-2.56	-0.0247	-2.50

								Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	Benzene	0.17625	0.3238	0.1171	23.42	0.3772	31.42	0.3350	0.1212	23.70	0.3852	31.97
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	Toluene	0.32056	1.0094	0.3652	27.46	0.5147	40.23	1.4001	0.5065	29.44	0.6079	45.55
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	Ethylbenzene	0.11941	0.2506	0.0906	24.50	0.4091	33.58	0.6374	0.2306	30.47	0.6680	48.73
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	Total Xylenes (m,p, and o)	0.87101	1.4490	0.5242	22.59	0.3544	29.84	1.4893	0.5388	22.83	0.3606	30.28
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	Total BTEX	1.48723	3.0328	1.0971	24.27	0.4021	33.11	3.8619	1.3970	26.12	0.4630	37.06
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	1,2,3-Trimethylbenzene	0.48276	-0.4828	-0.1746	#DIV/0!	#DIV/0!	#DIV/0!	-0.0326	-0.0118	-2.62	-0.0253	-2.56
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	1,2,4-Trimethylbenzene	0.92976	0.0802	0.0290	2.87	0.0299	2.95	-0.1130	-0.0409	-5.01	-0.0469	-4.80
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	1,3,5-Trimethylbenzene	0.52490	-0.1049	-0.0379	-9.04	-0.0807	-8.40	-0.4031	-0.1458	-119.70	-0.5284	-69.62
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	Naphthalene	0.18391	0.3161	0.1143	22.87	0.3618	30.36	0.0904	0.0327	11.92	0.1446	13.47
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	1-MethylNaphthalene	0.18902	0.5910	0.2138	27.41	0.5128	40.12	-0.1529	-0.0553	-152.92	-0.5983	-81.90
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	2-MethylNaphthalene	0.31801	0.2420	0.0875	15.63	0.2047	18.51	-0.1597	-0.0578	-36.47	-0.2522	-28.69
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/6/1997	SHMW1610-3	Total Naphthalenes	0.69093	1.1491	0.4157	22.59	0.3543	29.84	-0.2221	-0.0803	-17.14	-0.1403	-15.06

								Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	Benzene	0.16026	0.3397	0.0899	17.98	0.3012	26.00	0.3510	0.0929	18.17	0.3070	26.44
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	Toluene	0.36282	0.9672	0.2560	19.25	0.3438	29.10	1.3579	0.3594	20.89	0.4120	33.77
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	Ethylbenzene	0.13333	0.2367	0.0626	16.93	0.2702	23.67	0.6235	0.1650	21.81	0.4596	36.84
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	Total Xylenes (m,p, and o)	0.92051	1.3995	0.3704	15.97	0.2447	21.70	1.4398	0.3811	16.15	0.2492	22.06
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	Total BTEX	1.57692	2.9431	0.7790	17.23	0.2787	24.33	3.7722	0.9984	18.67	0.3233	27.62
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	1,2,3-Trimethylbenzene	0.40128	-0.4013	-0.1062	#DIV/0!	#DIV/0!	#DIV/0!	0.0488	0.0129	2.87	0.0304	2.99
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	1,2,4-Trimethylbenzene	0.93846	0.0715	0.0189	1.87	0.0194	1.93	-0.1218	-0.0322	-3.95	-0.0368	-3.75
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	1,3,5-Trimethylbenzene	0.28205	0.1379	0.0365	8.69	0.1054	10.00	-0.1602	-0.0424	-34.81	-0.2222	-24.88
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	Naphthalene	0.16923	0.3308	0.0875	17.51	0.2867	24.93	-0.1692	-0.0448	-16.33	0.1278	12.00
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	1-MethylNaphthalene	0.16923	0.6108	0.1617	20.73	0.4044	33.27	-0.1331	-0.0352	-97.41	-0.4085	-50.45
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	2-MethylNaphthalene	0.28205	0.2779	0.0736	13.14	0.1815	16.60	-0.1237	-0.0327	-20.68	-0.1528	-16.51
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-2	Total Naphthalenes	0.62051	1.2195	0.3228	17.54	0.2877	25.00	-0.1517	-0.0401	-8.56	-0.0742	-7.70

								Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	Benzene	0.21236	0.2876	0.0761	15.23	0.2267	20.28	0.2989	0.0791	15.47	0.2325	20.75
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	Toluene	0.42342	0.9066	0.2400	18.04	0.3029	26.14	1.2973	0.3434	19.96	0.3711	31.00
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	Ethylbenzene	0.13771	0.2323	0.0615	16.62	0.2616	23.02	0.6191	0.1639	21.65	0.4510	36.30
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	Total Xylenes (m,p, and o)	0.92793	1.3921	0.3685	15.88	0.2425	21.54	1.4324	0.3791	16.06	0.2471	21.89
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	Total BTEX	1.70142	2.8186	0.7460	16.51	0.2586	22.79	3.6477	0.9655	18.05	0.3032	26.15
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	1,2,3-Trimethylbenzene	0.36808	-0.3681	-0.0974	#DIV/0!	#DIV/0!	#DIV/0!	0.0820	0.0217	4.82	0.0533	5.19
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	1,2,4-Trimethylbenzene	0.86100	0.1490	0.0394	3.90	0.0422	4.14	-0.0443	-0.0117	-1.44	-0.0140	-1.41
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	1,3,5-Trimethylbenzene	0.25869	0.1613	0.0427	10.17	0.1283	12.04	-0.1369	-0.0362	-29.74	-0.1993	-22.06
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	Naphthalene	0.15830	0.3417	0.0904	18.09	0.3044	26.24	-0.1583	-0.0419	-15.27	0.1455	13.54
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	1-MethylNaphthalene	0.15444	0.6256	0.1656	21.23	0.4287	34.86	-0.1183	-0.0313	-86.58	-0.3843	-46.86
NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	2-MethylNaphthalene	0.25483	0.3052	0.0808	14.42	0.2084	18.81	-0.0965	-0.0255	-16.13	-0.1259	-13.42

NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	3/11/1998	SH98-1610-3	Total Naphthalenes	0.56757	1.2724	0.3368	18.30	0.3113	26.75	-0.0987	-0.0261	-5.57	-0.0506	-5.19

								Smith et al., 1981					**Hughes et al., 1984**				
Lab		**Fuel**	**Spill**	**Sample**					**Linear**		**Exponential**			**Linear**		**Exponential**	
Code	**Site Name**	**Type**	**Date**	**Date**	**Locid**	**Analyte**	**Mass Fraction**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	Benzene	0.07949	0.4205	0.0517	10.34	0.2261	20.23	0.4317	0.0531	10.38	0.2288	20.45
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	Toluene	0.35897	0.9710	0.1194	8.98	0.1610	14.87	1.3617	0.1674	9.73	0.1927	17.52
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	Ethylbenzene	0.15385	0.2162	0.0266	7.18	0.1079	10.23	0.6030	0.0741	9.79	0.1959	17.79
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	Total Xylenes (m,p, and o)	1.53846	0.7815	0.0961	4.14	0.0505	4.92	0.8219	0.1010	4.28	0.0526	5.13
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	Total BTEX	2.13077	2.3892	0.2937	6.50	0.0925	8.83	3.2184	0.3957	7.40	0.1132	10.70
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	1,2,3-Trimethylbenzene	0.58974	-0.5897	-0.0725	#DIV/0!	#DIV/0!	#DIV/0!	-0.1396	-0.0172	-3.81	-0.0332	-3.38
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	1,2,4-Trimethylbenzene	1.41026	-0.4003	-0.0492	-4.87	-0.0410	-4.19	-0.5935	-0.0730	-8.93	-0.0672	-6.95
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	1,3,5-Trimethylbenzene	0.46154	-0.0415	-0.0051	-1.22	-0.0116	-1.17	-0.3397	-0.0418	-34.28	-0.1638	-17.79
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-1	Naphthalene	0.09487	0.4051	0.0498	9.96	0.2043	18.48	0.1794	0.0221	8.04	0.1305	12.24

								Smith et al., 1981					**Hughes et al., 1984**				
Lab		**Fuel**	**Spill**	**Sample**					**Linear**		**Exponential**			**Linear**		**Exponential**	
Code	**Site Name**	**Type**	**Date**	**Date**	**Locid**	**Analyte**	**Mass Fraction**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	Benzene	0.14103	0.3590	0.0441	8.83	0.1556	14.41	0.3702	0.0455	8.90	0.1583	14.64
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	Toluene	0.37179	0.9582	0.1178	8.86	0.1567	14.50	1.3489	0.1658	9.64	0.1884	17.17
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	Ethylbenzene	0.15385	0.2162	0.0266	7.18	0.1079	10.23	0.6030	0.0741	9.79	0.1959	17.79
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	Total Xylenes (m,p, and o)	1.41026	0.9097	0.1118	4.82	0.0612	5.94	0.9501	0.1168	4.95	0.0633	6.14
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	Total BTEX	2.07692	2.4431	0.3003	6.64	0.0956	9.12	3.2722	0.4023	7.52	0.1163	10.98
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	1,2,3-Trimethylbenzene	0.61538	-0.6154	-0.0757	#DIV/0!	#DIV/0!	#DIV/0!	-0.1653	-0.0203	-4.51	-0.0384	-3.92
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	1,2,4-Trimethylbenzene	1.53846	-0.5285	-0.0650	-6.43	-0.0517	-5.31	-0.7218	-0.0887	-10.86	-0.0779	-8.10
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	1,3,5-Trimethylbenzene	0.47436	-0.0544	-0.0067	-1.59	-0.0150	-1.51	-0.3525	-0.0433	-35.58	-0.1671	-18.19
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-2	Naphthalene	0.11282	0.3872	0.0476	9.52	0.1830	16.73	-0.1128	-0.0139	-5.06	0.1092	10.35

								Smith et al., 1981					**Hughes et al., 1984**				
Lab		**Fuel**	**Spill**	**Sample**					**Linear**		**Exponential**			**Linear**		**Exponential**	
Code	**Site Name**	**Type**	**Date**	**Date**	**Locid**	**Analyte**	**Mass Fraction**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	Benzene	0.15385	0.3462	0.0426	8.51	0.1449	13.49	0.3574	0.0439	8.59	0.1476	13.72
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	Toluene	0.33333	0.9967	0.1225	9.21	0.1701	15.64	1.3874	0.1706	9.91	0.2018	18.27
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	Ethylbenzene	0.15385	0.2162	0.0266	7.18	0.1079	10.23	0.6030	0.0741	9.79	0.1959	17.79
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	Total Xylenes (m,p, and o)	1.28205	1.0379	0.1276	5.50	0.0729	7.03	1.0783	0.1326	5.62	0.0750	7.23
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	Total BTEX	1.92308	2.5969	0.3193	7.06	0.1051	9.97	3.4261	0.4212	7.87	0.1258	11.82
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	1,2,3-Trimethylbenzene	0.53846	-0.5385	-0.0662	#DIV/0!	#DIV/0!	#DIV/0!	-0.0883	-0.0109	-2.41	-0.0220	-2.23
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	1,2,4-Trimethylbenzene	1.28205	-0.2721	-0.0334	-3.31	-0.0293	-2.98	-0.4653	-0.0572	-7.00	-0.0554	-5.70
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	1,3,5-Trimethylbenzene	0.43590	-0.0159	-0.0020	-0.47	-0.0046	-0.46	-0.3141	-0.0386	-31.70	-0.1567	-16.97
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-3	Naphthalene	0.11538	0.3846	0.0473	9.46	0.1803	16.50	-0.1154	-0.0142	-5.17	0.1065	10.10

								Smith et al., 1981					**Hughes et al., 1984**				
Lab		**Fuel**	**Spill**	**Sample**					**Linear**		**Exponential**			**Linear**		**Exponential**	
Code	**Site Name**	**Type**	**Date**	**Date**	**Locid**	**Analyte**	**Mass Fraction**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	Benzene	0.12821	0.3718	0.0457	9.14	0.1673	15.41	0.3830	0.0471	9.21	0.1700	15.64
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	Toluene	0.35897	0.9710	0.1194	8.98	0.1610	14.87	1.3617	0.1674	9.73	0.1927	17.52
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	Ethylbenzene	0.15385	0.2162	0.0266	7.18	0.1079	10.23	0.6030	0.0741	9.79	0.1959	17.79
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	Total Xylenes (m,p, and o)	1.41026	0.9097	0.1118	4.82	0.0612	5.94	0.9501	0.1168	4.95	0.0633	6.14
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	Total BTEX	2.05128	2.4687	0.3035	6.71	0.0971	9.26	3.2978	0.4054	7.58	0.1178	11.12
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	1,2,3-Trimethylbenzene	0.61538	-0.6154	-0.0757	#DIV/0!	#DIV/0!	#DIV/0!	-0.1653	-0.0203	-4.51	-0.0384	-3.92
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	1,2,4-Trimethylbenzene	1.53846	-0.5285	-0.0650	-6.43	-0.0517	-5.31	-0.7218	-0.0887	-10.86	-0.0779	-8.10
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	1,3,5-Trimethylbenzene	0.51282	-0.0928	-0.0114	-2.72	-0.0245	-2.49	-0.3910	-0.0481	-39.46	-0.1767	-19.33
OBG	Bldg 1610, Shaw AFB, SC	JP-4	6/1/1994	7/18/2002	Shaw-1610-MW-22	Naphthalene	0.10897	0.3910	0.0481	9.61	0.1873	17.08	-0.1090	-0.0134	-4.88	0.1135	10.73

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Smith et al., 1981					Hughes et al., 1984				
									Linear		Exponential			Linear		Exponential	
								C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	-k	%Red./yr
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	Benzene	0.0000	0.5000	0.0224	4.48	0.5398	41.71	0.5112	0.0229	4.48	0.5408	41.77
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	Toluene	0.0000	1.3300	0.0596	4.48	0.5836	44.21	1.7207	0.0771	4.48	0.5952	44.85
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	Ethylbenzene	0.0000	0.3700	0.0166	4.48	0.5263	40.92	0.7569	0.0339	4.48	0.5583	42.78
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	m-Xylene	0.0000	0.9600	0.0430	4.48	0.5690	43.39	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	o-Xylene	0.0000	1.0100	0.0453	4.48	0.5713	43.52	0.6272	0.0281	4.48	0.5499	42.30
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	p-Xylene	0.0000	0.3500	0.0157	4.48	0.5238	40.77	1.7332	0.0777	4.48	0.5955	44.87
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	m,p-xylenes	0.0000	1.3100	0.0587	4.48	0.5519	42.41	1.7332	0.0777	4.48	0.5644	43.13
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	Total Xylenes (m,p, and o)	0.0000	2.3200	0.1040	4.48	0.5593	42.84	2.3603	0.1058	4.48	0.5601	42.88
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	Total BTEX	0.0000	4.5200	0.2026	4.48	0.5581	42.77	5.3491	0.2397	4.48	0.5657	43.20
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	1,2,3-Trimethylbenzene	0.0065	-0.0065	-0.0003	#DIV/0!	#DIV/0!	#DIV/0!	0.4436	0.0199	4.42	0.1897	17.28
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	1,2,4-Trimethylbenzene	0.0052	1.0048	0.0450	4.46	0.2360	21.02	0.8115	0.0364	4.45	0.2265	20.27
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	1,3,5-Trimethylbenzene	0.0005	0.4195	0.0188	4.48	0.3006	25.96	0.1213	0.0054	4.46	0.2451	21.74
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	Naphthalene	0.0000	0.5000	0.0224	4.48	0.5398	41.71	0.2743	0.0123	4.48	0.5129	40.12
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	1-MethylNaphthalene	0.0155	0.7645	0.0343	4.39	0.1756	16.10	0.0207	0.0009	2.56	0.0379	3.72
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	2-MethylNaphthalene	0.0143	0.5457	0.0245	4.37	0.1643	15.15	0.1440	0.0065	4.08	0.1077	10.21
NRMRL	McChord	JP-4	6/1/75	9/18/97	WA-CR02	Total Naphthalenes	0.0298	1.8102	0.0811	4.41	0.1847	16.86	0.4390	0.0197	4.20	0.1234	11.61

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Smith et al., 1981 Linear C_o - C	k	%Red./yr	Exponential k	%Red./yr	Hughes et al., 1984 Linear C_o - C	k	%Red./yr	Exponential k	%Red./yr
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	Benzene	0.00210	0.4979	0.0300	6.01	0.3303	28.13	0.5091	0.0307	6.01	0.3316	28.22
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	Toluene	0.03600	1.2940	0.0781	5.87	0.2178	19.57	1.6847	0.1017	5.91	0.2334	20.81
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	Ethylbenzene	0.23000	0.1400	0.0084	2.28	0.0287	2.83	0.5269	0.0318	4.20	0.0719	6.94
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	Total Xylenes (m,p, and o)	1.80000	0.5200	0.0314	1.35	0.0153	1.52	0.5603	0.0338	1.43	0.0164	1.62
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	Total BTEX	2.06810	2.4519	0.1480	3.27	0.0472	4.61	3.2810	0.1980	3.70	0.0574	5.57
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	1,2,3-Trimethylbenzene	0.29000	-0.2900	-0.0175	#DIV/0!	#DIV/0!	#DIV/0!	0.1601	0.0097	2.15	0.0265	2.62
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	1,2,4-Trimethylbenzene	1.40000	-0.3900	-0.0235	-2.33	-0.0197	-1.99	-0.5833	-0.0352	-4.31	-0.0325	-3.31
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	1,3,5-Trimethylbenzene	0.43000	-0.0100	-0.0006	-0.14	-0.0014	-0.14	-0.3082	-0.0186	-15.27	-0.0761	-7.91
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW4	Naphthalene	0.07800	0.4220	0.0255	5.09	0.1121	10.61	0.1963	0.0118	4.32	0.0759	7.31

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Smith et al., 1981 Linear C_o - C	k	%Red./yr	Exponential k	%Red./yr	Hughes et al., 1984 Linear C_o - C	k	%Red./yr	Exponential k	%Red./yr
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	Benzene	0.04400	0.4560	0.0275	5.50	0.1467	13.64	0.4672	0.0282	5.52	0.1480	13.76
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	Toluene	0.48000	0.8500	0.0513	3.86	0.0615	5.97	1.2407	0.0749	4.35	0.0770	7.42
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	Ethylbenzene	0.09200	0.2780	0.0168	4.53	0.0840	8.06	0.6649	0.0401	5.30	0.1272	11.94
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	Total Xylenes (m,p, and o)	1.20000	1.1200	0.0676	2.91	0.0398	3.90	1.1603	0.0700	2.97	0.0408	4.00
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	Total BTEX	1.81600	2.7040	0.1632	3.61	0.0550	5.35	3.5331	0.2132	3.99	0.0652	6.31
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	1,2,3-Trimethylbenzene	0.19000	-0.1900	-0.0115	#DIV/0!	#DIV/0!	#DIV/0!	0.2601	0.0157	3.49	0.0521	5.07
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	1,2,4-Trimethylbenzene	0.63000	0.3800	0.0229	2.27	0.0285	2.81	0.1867	0.0113	1.38	0.0157	1.55
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	1,3,5-Trimethylbenzene	0.25000	0.1700	0.0103	2.44	0.0313	3.08	-0.1282	-0.0077	-6.35	-0.0434	-4.43
OBG	AGE area, Seymour Johnson AFB, SC	JP-4	1/1/1985	7/24/2001	SJ-AGE-MW13	Naphthalene	0.13000	0.3700	0.0223	4.47	0.0813	7.81	0.1443	0.0087	3.17	0.0451	4.41

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	Benzene	0.00035	0.4996	0.0209	4.18	0.3032	26.16	0.5109	0.0214	4.18	0.3041	26.22
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	Toluene	0.00000	1.3300	0.0556	4.18	0.5398	41.72	1.7207	0.0719	4.18	0.5506	42.34
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	Ethylbenzene	0.32520	0.0448	0.0019	0.51	0.0054	0.54	0.4317	0.0180	2.38	0.0353	3.47
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	Total Xylenes (m,p, and o)	0.67532	1.6447	0.0688	2.96	0.0516	5.03	1.6850	0.0704	2.98	0.0523	5.10
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	Total BTEX	1.00088	3.5191	0.1471	3.25	0.0630	6.11	4.3482	0.1818	3.40	0.0701	6.77
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	1,2,3-Trimethylbenzene	0.25570	-0.2557	-0.0107	#DIV/0!	#DIV/0!	#DIV/0!	0.1944	0.0081	1.81	0.0236	2.34
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	1,2,4-Trimethylbenzene	0.99266	0.0173	0.0007	0.07	0.0007	0.07	-0.1759	-0.0074	-0.90	-0.0082	-0.82
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	1,3,5-Trimethylbenzene	0.55206	-0.1321	-0.0055	-1.31	-0.0114	-1.15	-0.4302	-0.0180	-14.76	-0.0632	-6.52
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	Naphthalene	0.13769	0.3623	0.0151	3.03	0.0539	5.25	0.1366	0.0057	2.08	0.0288	2.84
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	1-MethylNaphthalene	0.28193	0.4981	0.0208	2.67	0.0425	4.17	-0.2458	-0.0103	-28.41	-0.0859	-8.96
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	2-MethylNaphthalene	0.51796	0.0420	0.0018	0.31	0.0033	0.33	-0.3596	-0.0150	-9.49	-0.0495	-5.08
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW306-FP	Total Naphthalenes	0.93758	0.9024	0.0377	2.05	0.0282	2.78	-0.4688	-0.0196	-4.18	-0.0290	-2.94

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	Benzene	0.11682	0.3832	0.0160	3.20	0.0608	5.90	0.3944	0.0165	3.23	0.0617	5.98
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	Toluene	0.00000	1.3300	0.0556	4.18	0.5403	41.74	1.7207	0.0719	4.18	0.5510	42.36
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	Ethylbenzene	0.38422	-0.0142	-0.0006	-0.16	-0.0016	-0.16	0.3726	0.0156	2.06	0.0283	2.79
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	Total Xylenes (m,p, and o)	1.99896	0.3210	0.0134	0.58	0.0062	0.62	0.3614	0.0151	0.64	0.0069	0.69
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	Total BTEX	2.50000	2.0200	0.0844	1.87	0.0248	2.45	2.8491	0.1191	2.23	0.0318	3.13
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	1,2,3-Trimethylbenzene	0.44652	-0.4465	-0.0187	#DIV/0!	#DIV/0!	#DIV/0!	0.0036	0.0002	0.03	0.0003	0.03
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	1,2,4-Trimethylbenzene	1.24740	-0.2374	-0.0099	-0.98	-0.0088	-0.89	-0.4307	-0.0180	-2.20	-0.0177	-1.79
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	1,3,5-Trimethylbenzene	0.64642	-0.2264	-0.0095	-2.25	-0.0180	-1.82	-0.5246	-0.0219	-18.00	-0.0698	-7.23
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	Naphthalene	0.12980	0.3702	0.0155	3.10	0.0564	5.48	0.1445	0.0060	2.20	0.0313	3.08
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	1-MethylNaphthalene	0.20898	0.5710	0.0239	3.06	0.0551	5.36	-0.1728	-0.0072	-19.98	-0.0733	-7.61
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	2-MethylNaphthalene	0.37643	0.1836	0.0077	1.37	0.0166	1.65	-0.2181	-0.0091	-5.76	-0.0362	-3.69
NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	8/27/1997	EAKMW316-FP	Total Naphthalenes	0.71521	1.1248	0.0470	2.56	0.0395	3.87	-0.2464	-0.0103	-2.20	-0.0177	-1.78

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	Benzene	0.00120	0.4988	0.0178	3.56	0.2151	19.35	0.5100	0.0182	3.56	0.2159	19.42
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	Toluene	0.00170	1.3283	0.0474	3.56	0.2376	21.15	1.7190	0.0613	3.56	0.2468	21.87
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	Ethylbenzene	0.25000	0.1200	0.0043	1.16	0.0140	1.39	0.5069	0.0181	2.39	0.0395	3.87
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	Total Xylenes (m,p, and o)	0.53000	1.7900	0.0638	2.75	0.0526	5.13	1.8303	0.0653	2.77	0.0533	5.19
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	Total BTEX	0.53000	3.9900	0.1423	3.15	0.0764	7.36	4.8191	0.1718	3.21	0.0824	7.91
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	1,2,3-Trimethylbenzene	0.26000	-0.2600	-0.0093	#DIV/0!	#DIV/0!	#DIV/0!	0.1901	0.0068	1.51	0.0196	1.94
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	1,2,4-Trimethylbenzene	1.10000	-0.0900	-0.0032	-0.32	-0.0030	-0.30	-0.2833	-0.0101	-1.24	-0.0106	-1.07
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	1,3,5-Trimethylbenzene	0.56000	-0.1400	-0.0050	-1.19	-0.0103	-1.03	-0.4382	-0.0156	-12.83	-0.0544	-5.59
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW306-FP	Naphthalene	0.17000	0.3300	0.0118	2.35	0.0385	3.77	0.1043	0.0037	1.36	0.0171	1.69

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	Benzene	0.22000	0.2800	0.0100	2.00	0.0293	2.89	0.2912	0.0104	2.03	0.0301	2.96
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	Toluene	0.00080	1.3292	0.0474	3.56	0.2644	23.24	1.7199	0.0613	3.56	0.2736	23.94
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	Ethylbenzene	0.44000	-0.0700	-0.0025	-0.67	-0.0062	-0.62	0.3169	0.0113	1.49	0.0193	1.92
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	Total Xylenes (m,p, and o)	2.20000	0.1200	0.0043	0.18	0.0019	0.19	0.1603	0.0057	0.24	0.0025	0.25
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	Total BTEX	2.86080	1.6592	0.0592	1.31	0.0163	1.62	2.4883	0.0887	1.66	0.0223	2.21
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	1,2,3-Trimethylbenzene	0.40000	-0.4000	-0.0143	#DIV/0!	#DIV/0!	#DIV/0!	0.0501	0.0018	0.40	0.0042	0.42
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	1,2,4-Trimethylbenzene	1.30000	-0.2900	-0.0103	-1.02	-0.0090	-0.90	-0.4833	-0.0172	-2.11	-0.0166	-1.67
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	1,3,5-Trimethylbenzene	0.62000	-0.2000	-0.0071	-1.70	-0.0139	-1.40	-0.4982	-0.0178	-14.58	-0.0580	-5.97
OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/1/1973	10/10/2001	EAKMW316-FP	Naphthalene	0.15000	0.3500	0.0125	2.50	0.0429	4.20	0.1243	0.0044	1.62	0.0215	2.13

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	Benzene	0.02813	0.4719 ,		5.83	0.1778	16.29	0.4831	0.0299	5.84	0.1792	16.41
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	Toluene	0.00101	1.3290	0.0821	6.18	0.4442	35.87	1.7197	0.1063	6.18	0.4601	36.88
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	Ethylbenzene	0.18133	0.1887	0.0117	3.15	0.0441	4.31	0.5755	0.0356	4.70	0.0883	8.45
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	Total Xylenes (m,p, and o)	0.56828	1.7517	0.1083	4.67	0.0869	8.33	1.7921	0.1108	4.69	0.0880	8.42
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	Total BTEX	0.77875	3.7412	0.2312	5.12	0.1087	10.30	4.5704	0.2825	5.28	0.1191	11.23
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	1,2,3-Trimethylbenzene	0.34400	-0.3440	-0.0213	#DIV/0!	#DIV/0!	#DIV/0!	0.1061	0.0066	1.46	0.0166	1.65
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	1,2,4-Trimethylbenzene	0.82133	0.1887	0.0117	1.15	0.0128	1.27	-0.0046	-0.0003	-0.03	-0.0003	-0.03
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	1,3,5-Trimethylbenzene	0.47333	-0.0533	-0.0033	-0.78	-0.0074	-0.74	-0.3515	-0.0217	-17.83	-0.0839	-8.75
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	Naphthalene	0.15467	0.3453	0.0213	4.27	0.0725	6.99	0.1196	0.0074	2.70	0.0354	3.48
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	1-MethylNaphthalene	0.17333	0.6067	0.0375	4.81	0.0930	8.88	-0.1372	-0.0085	-23.44	-0.0969	-10.17
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	2-MethylNaphthalene	0.25467	0.3053	0.0189	3.37	0.0487	4.75	-0.0963	-0.0060	-3.76	-0.0294	-2.98
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW8I	Total Naphthalenes	0.58267	1.2573	0.0777	4.22	0.0711	6.86	-0.1138	-0.0070	-1.50	-0.0134	-1.35

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	Benzene	0.00736	0.4926	0.0304	6.09	0.2607	22.95	0.5039	0.0311	6.09	0.2621	23.06
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	Toluene	0.00073	1.3293	0.0822	6.18	0.4641	37.13	1.7200	0.1063	6.18	0.4800	38.12
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	Ethylbenzene	0.07853	0.2915	0.0180	4.87	0.0958	9.13	0.6783	0.0419	5.54	0.1400	13.07
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	Total Xylenes (m,p, and o)	0.27974	2.0403	0.1261	5.43	0.1307	12.26	2.0806	0.1286	5.45	0.1318	12.35
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	Total BTEX	0.36636	4.1536	0.2567	5.68	0.1553	14.38	4.9828	0.3079	5.76	0.1657	15.27
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	1,2,3-Trimethylbenzene	0.29800	-0.2980	-0.0184	#DIV/0!	#DIV/0!	#DIV/0!	0.1521	0.0094	2.09	0.0255	2.52
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	1,2,4-Trimethylbenzene	0.65000	0.3600	0.0222	2.20	0.0272	2.69	0.1667	0.0103	1.26	0.0141	1.40
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	1,3,5-Trimethylbenzene	0.28400	0.1360	0.0084	2.00	0.0242	2.39	-0.1622	-0.0100	-8.23	-0.0523	-5.37
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	Naphthalene	0.08920	0.4108	0.0254	5.08	0.1065	10.11	0.1851	0.0114	4.17	0.0694	6.71
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	1-MethylNaphthalene	0.13200	0.6480	0.0400	5.13	0.1098	10.40	-0.0958	-0.0059	-16.38	-0.0800	-8.33
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	2-MethylNaphthalene	0.18100	0.3790	0.0234	4.18	0.0698	6.74	-0.0226	-0.0014	-0.88	-0.0083	-0.83
NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	3/4/1997	MBMW24	Total Naphthalenes	0.40220	1.4378	0.0889	4.83	0.0940	8.97	0.0666	0.0041	0.88	0.0095	0.94

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	Benzene	0.01200	0.4880	0.0237	4.74	0.1813	16.58	0.4992	0.0243	4.75	0.1823	16.67
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	Toluene	0.00150	1.3285	0.0646	4.85	0.3299	28.10	1.7192	0.0836	4.86	0.3424	28.99
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	Ethylbenzene	0.07600	0.2940	0.0143	3.86	0.0769	7.40	0.6809	0.0331	4.37	0.1117	10.57
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	Total Xylenes (m,p, and o)	0.03310	2.2869	0.1111	4.79	0.2065	18.66	2.3272	0.1131	4.79	0.2074	18.73
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	Total BTEX	0.12260	4.3974	0.2137	4.73	0.1753	16.08	5.2265	0.2540	4.75	0.1835	16.77
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	1,2,3-Trimethylbenzene	0.29000	-0.2900	-0.0141	#DIV/0!	#DIV/0!	#DIV/0!	0.1601	0.0078	1.73	0.0214	2.11
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	1,2,4-Trimethylbenzene	1.20000	-0.1900	-0.0092	-0.91	-0.0084	-0.84	-0.3833	-0.0186	-2.28	-0.0187	-1.89
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	1,3,5-Trimethylbenzene	0.10000	0.3200	0.0156	3.70	0.0697	6.74	0.0218	0.0011	0.87	0.0096	0.95
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW24	Naphthalene	0.14000	0.3600	0.0175	3.50	0.0619	6.00	0.1343	0.0065	2.38	0.0327	3.22

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	Benzene	0.02600	0.4740	0.0230	4.61	0.1437	13.38	0.4852	0.0236	4.61	0.1448	13.48
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	Toluene	0.00210	1.3279	0.0645	4.85	0.3135	26.91	1.7186	0.0835	4.85	0.3260	27.82
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	Ethylbenzene	0.17000	0.2000	0.0097	2.63	0.0378	3.71	0.5869	0.0285	3.77	0.0726	7.00
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	Total Xylenes (m,p, and o)	0.16000	2.1600	0.1050	4.53	0.1300	12.19	2.2003	0.1069	4.53	0.1308	12.26
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	Total BTEX	0.35810	4.1619	0.2023	4.48	0.1232	11.59	4.9910	0.2426	4.53	0.1314	12.31
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	1,2,3-Trimethylbenzene	0.24000	-0.2400	-0.0117	#DIV/0!	#DIV/0!	#DIV/0!	0.2101	0.0102	2.27	0.0306	3.01
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	1,2,4-Trimethylbenzene	0.94000	0.0700	0.0034	0.34	0.0035	0.35	-0.1233	-0.0060	-0.73	-0.0068	-0.69
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	1,3,5-Trimethylbenzene	0.21000	0.2100	0.0102	2.43	0.0337	3.31	-0.0882	-0.0043	-3.52	-0.0265	-2.68
OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	1/1/1981	7/25/2001	MBMW8I	Naphthalene	0.15000	0.3500	0.0170	3.40	0.0585	5.68	0.1243	0.0060	2.20	0.0293	2.89

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	Benzene	0.00130	0.4987	0.0274	5.49	0.3273	27.91	0.5099	0.0280	5.49	0.3285	28.00
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	Toluene	0.00568	1.3243	0.0728	5.48	0.3001	25.92	1.7150	0.0943	5.48	0.3142	26.96
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	Ethylbenzene	0.04778	0.3222	0.0177	4.79	0.1126	10.65	0.7091	0.0390	5.15	0.1519	14.10
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	Total Xylenes (m,p, and o)	0.18710	2.1329	0.1173	5.06	0.1385	12.93	2.1732	0.1195	5.06	0.1394	13.01
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	Total BTEX	0.24188	4.2781	0.2353	5.21	0.1610	14.87	5.1073	0.2809	5.25	0.1703	15.66
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	1,2,3-Trimethylbenzene	0.07782	-0.0778	-0.0043	#DIV/0!	#DIV/0!	#DIV/0!	0.3723	0.0205	4.55	0.0965	9.20
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	1,2,4-Trimethylbenzene	0.17500	0.8350	0.0459	4.55	0.0964	9.19	0.6417	0.0353	4.32	0.0847	8.12
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	1,3,5-Trimethylbenzene	0.09917	0.3208	0.0176	4.20	0.0794	7.63	0.0227	0.0012	1.02	0.0113	1.13
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	Naphthalene	0.05821	0.4418	0.0243	4.86	0.1183	11.16	0.2161	0.0119	4.33	0.0853	8.17
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	1-MethylNaphthalene	0.18990	0.5901	0.0325	4.16	0.0777	7.48	-0.1537	-0.0085	-23.39	-0.0912	-9.55
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	2-MethylNaphthalene	0.22465	0.3354	0.0184	3.29	0.0502	4.90	-0.0663	-0.0036	-2.30	-0.0192	-1.94
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	12/1/1993	CH-EW6	Total Naphthalenes	0.47276	1.3672	0.0752	4.09	0.0747	7.20	-0.0039	-0.0002	-0.05	-0.0005	-0.05

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	Benzene	0.02697	0.4730	0.0241	4.83	0.1490	13.84	0.4843	0.0247	4.83	0.1502	13.94
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	Toluene	0.00586	1.3241	0.0676	5.08	0.2769	24.18	1.7148	0.0875	5.09	0.2900	25.17
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	Ethylbenzene	0.27355	0.0965	0.0049	1.33	0.0154	1.53	0.4833	0.0247	3.26	0.0519	5.06
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	Total Xylenes (m,p, and o)	0.85845	1.4615	0.0746	3.22	0.0507	4.95	1.5019	0.0766	3.25	0.0516	5.03
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	Total BTEX	1.16483	3.3552	0.1712	3.79	0.0692	6.69	4.1843	0.2135	3.99	0.0778	7.48
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	1,2,3-Trimethylbenzene	0.12723	-0.1272	-0.0065	#DIV/0!	#DIV/0!	#DIV/0!	0.3229	0.0165	3.66	0.0645	6.25
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	1,2,4-Trimethylbenzene	0.34452	0.6655	0.0340	3.36	0.0549	5.34	0.4722	0.0241	2.95	0.0441	4.31
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	1,3,5-Trimethylbenzene	0.14581	0.2742	0.0140	3.33	0.0540	5.26	-0.0240	-0.0012	-1.00	-0.0092	-0.92
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	Naphthalene	0.13548	0.3645	0.0186	3.72	0.0666	6.45	0.1388	0.0071	2.58	0.0360	3.54
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	1-MethylNaphthalene	0.20516	0.5748	0.0293	3.76	0.0682	6.59	-0.1690	-0.0086	-23.85	-0.0886	-9.26
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	2-MethylNaphthalene	0.26968	0.2903	0.0148	2.65	0.0373	3.66	-0.1113	-0.0057	-3.59	-0.0272	-2.75
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	WQ27B	Total Naphthalenes	0.61032	1.2297	0.0628	3.41	0.0563	5.48	-0.1415	-0.0072	-1.54	-0.0135	-1.36

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	DFSP-Charleston, Tank 3 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	Benzene	0.00000	0.5000	0.0255	5.10	0.6110	45.72	0.5112	0.0261	5.10	0.6121	45.78
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	Toluene	0.00265	1.3273	0.0677	5.09	0.3173	27.19	1.7180	0.0877	5.10	0.3304	28.14
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	Ethylbenzene	0.00671	0.3633	0.0185	5.01	0.2046	18.50	0.7501	0.0383	5.06	0.2411	21.43
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	Total Xylenes (m,p, and o)	0.02536	2.2946	0.1171	5.05	0.2305	20.58	2.3350	0.1192	5.05	0.2314	20.65
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	Total BTEX	0.03473	4.4853	0.2289	5.06	0.2485	22.00	5.3144	0.2712	5.07	0.2571	22.67
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	1,2,3-Trimethylbenzene	0.15297	-0.1530	-0.0078	#DIV/0!	#DIV/0!	#DIV/0!	0.2972	0.0152	3.37	0.0551	5.36
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	1,2,4-Trimethylbenzene	0.20228	0.8077	0.0412	4.08	0.0821	7.88	0.6144	0.0314	3.84	0.0712	6.87
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	1,3,5-Trimethylbenzene	0.07345	0.3465	0.0177	4.21	0.0890	8.51	0.0484	0.0025	2.03	0.0258	2.55
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	Naphthalene	0.09709	0.4029	0.0206	4.11	0.0836	8.02	0.1772	0.0090	3.30	0.0530	5.16
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	1-MethylNaphthalene	0.24399	0.5360	0.0274	3.51	0.0593	5.76	-0.2078	-0.0106	-29.33	-0.0974	-10.23
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	2-MethylNaphthalene	0.33123	0.2288	0.0117	2.08	0.0268	2.64	-0.1729	-0.0088	-5.57	-0.0377	-3.84
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/1/1995	W108-DFSP	Total Naphthalenes	0.67231	1.1677	0.0596	3.24	0.0514	5.01	-0.2035	-0.0104	-2.22	-0.0184	-1.86

Lab		Fuel	Spill	Sample				Smith et al., 1981					Hughes et al., 1984				
								Linear			Exponential		Linear			Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	DFSP-Charleston, Tank 3 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	Benzene	0.00012	0.4999	0.0229	4.57	0.3823	31.77	0.5111	0.0234	4.57	0.3833	31.84
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	Toluene	0.00323	1.3268	0.0607	4.56	0.2752	24.06	1.7175	0.0785	4.56	0.2870	24.95
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	Ethylbenzene	0.02288	0.3471	0.0159	4.29	0.1273	11.95	0.7340	0.0336	4.43	0.1600	14.79
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	Total Xylenes (m,p, and o)	0.05212	2.2679	0.1037	4.47	0.1736	15.93	2.3082	0.1056	4.47	0.1744	16.00
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	Total BTEX	0.07835	4.4417	0.2031	4.49	0.1854	16.93	5.2708	0.2410	4.51	0.1931	17.56
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	1,2,3-Trimethylbenzene	0.15865	-0.1587	-0.0073	#DIV/0!	#DIV/0!	#DIV/0!	0.2915	0.0133	2.96	0.0477	4.66
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	1,2,4-Trimethylbenzene	0.26934	0.7407	0.0339	3.35	0.0604	5.86	0.5474	0.0250	3.06	0.0507	4.95
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	1,3,5-Trimethylbenzene	0.08535	0.3346	0.0153	3.64	0.0729	7.03	0.0365	0.0017	1.37	0.0163	1.61
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	Naphthalene	0.11844	0.3816	0.0174	3.49	0.0659	6.37	0.1559	0.0071	2.60	0.0384	3.77
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	1-MethylNaphthalene	0.27303	0.5070	0.0232	2.97	0.0480	4.69	-0.2369	-0.0108	-29.95	-0.0924	-9.69
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	2-MethylNaphthalene	0.36773	0.1923	0.0088	1.57	0.0192	1.90	-0.2094	-0.0096	-6.05	-0.0385	-3.93
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	8/8/1997	W-108	Total Naphthalenes	0.75919	1.0808	0.0494	2.69	0.0405	3.97	-0.2904	-0.0133	-2.83	-0.0220	-2.23

Smith et al., 1981 Hughes et al., 1984

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr	Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	Benzene	0.00000	0.5000	0.0231	4.62	0.5535	42.51	0.5112	0.0236	4.62	0.5545	42.56
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	Toluene	0.00017	1.3298	0.0614	4.62	0.4144	33.92	1.7205	0.0795	4.62	0.4263	34.71
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	Ethylbenzene	0.01147	0.3585	0.0166	4.48	0.1605	14.83	0.7454	0.0344	4.55	0.1936	17.60
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	Total Xylenes (m,p, and o)	0.04412	2.2759	0.1052	4.53	0.1831	16.73	2.3162	0.1070	4.53	0.1839	16.80
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	Total BTEX	0.05576	4.4642	0.2063	4.56	0.2031	18.38	5.2934	0.2446	4.57	0.2109	19.01
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	1,2,3-Trimethylbenzene	0.05628	-0.0563	-0.0026	#DIV/0!	#DIV/0!	#DIV/0!	0.3938	0.0182	4.04	0.0961	9.16
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	1,2,4-Trimethylbenzene	0.09598	0.9140	0.0422	4.18	0.1088	10.30	0.7207	0.0333	4.08	0.0989	9.42
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	1,3,5-Trimethylbenzene	0.06796	0.3520	0.0163	3.87	0.0842	8.07	0.0539	0.0025	2.04	0.0270	2.66
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	Naphthalene	0.05603	0.4440	0.0205	4.10	0.1011	9.62	0.2183	0.0101	3.68	0.0734	7.08
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	1-MethylNaphthalene	0.18593	0.5941	0.0275	3.52	0.0663	6.41	-0.1498	-0.0069	-19.14	-0.0757	-7.86
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	2-MethylNaphthalene	0.21985	0.3402	0.0157	2.81	0.0432	4.23	-0.0615	-0.0028	-1.79	-0.0152	-1.53
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/17/1997	CH-EW6	Total Naphthalenes	0.46181	1.3782	0.0637	3.46	0.0639	6.19	0.0070	0.0003	0.07	0.0007	0.07

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Smith et al., 1981 Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr	Hughes et al., 1984 Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	Benzene	0.00000	0.5000	0.0231	4.62	0.5514	42.39	0.5112	0.0236	4.62	0.5524	42.45
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	Toluene	0.02684	1.3032	0.0602	4.53	0.1804	16.50	1.6939	0.0783	4.55	0.1923	17.49
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	Ethylbenzene	0.11263	0.2574	0.0119	3.21	0.0550	5.35	0.6442	0.0298	3.93	0.0880	8.43
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	Total Xylenes (m,p, and o)	0.57868	1.7413	0.0805	3.47	0.0642	6.22	1.7817	0.0823	3.49	0.0650	6.29
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	Total BTEX	0.71816	3.8018	0.1757	3.89	0.0850	8.15	4.6310	0.2140	4.00	0.0928	8.86
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	1,2,3-Trimethylbenzene	0.12539	-0.1254	-0.0058	#DIV/0!	#DIV/0!	#DIV/0!	0.3247	0.0150	3.33	0.0591	5.74
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	1,2,4-Trimethylbenzene	0.28684	0.7232	0.0334	3.31	0.0582	5.65	0.5299	0.0245	3.00	0.0484	4.72
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	1,3,5-Trimethylbenzene	0.13684	0.2832	0.0131	3.12	0.0518	5.05	-0.0150	-0.0007	-0.57	-0.0054	-0.54
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	Naphthalene	0.06605	0.4339	0.0201	4.01	0.0935	8.93	0.2083	0.0096	3.51	0.0658	6.37
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	1-MethylNaphthalene	0.18421	0.5958	0.0275	3.53	0.0667	6.45	-0.1481	-0.0068	-18.92	-0.0752	-7.81
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	2-MethylNaphthalene	0.23684	0.3232	0.0149	2.67	0.0398	3.90	-0.0785	-0.0036	-2.29	-0.0186	-1.88
NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	5/16/1997	CH-MW-103	Total Naphthalenes	0.48711	1.3529	0.0625	3.40	0.0614	5.96	-0.0183	-0.0008	-0.18	-0.0018	-0.18

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Smith et al., 1981 Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr	Hughes et al., 1984 Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	Benzene	0.00110	0.4989	0.0189	3.78	0.2320	20.71	0.5101	0.0193	3.78	0.2329	20.77
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	Toluene	0.00110	1.3289	0.0504	3.79	0.2691	23.60	1.7196	0.0652	3.79	0.2789	24.34
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	Ethylbenzene	0.04900	0.3210	0.0122	3.29	0.0767	7.38	0.7079	0.0268	3.55	0.1038	9.86
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	Total Xylenes (m,p, and o)	0.17110	2.1489	0.0815	3.51	0.0989	9.41	2.1892	0.0830	3.52	0.0995	9.47
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	Total BTEX	0.22230	4.2977	0.1630	3.61	0.1142	10.79	5.1268	0.1944	3.63	0.1206	11.36
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	1,2,3-Trimethylbenzene	0.05900	-0.0590	-0.0022	#DIV/0!	#DIV/0!	#DIV/0!	0.3911	0.0148	3.29	0.0770	7.42
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	1,2,4-Trimethylbenzene	0.18000	0.8300	0.0315	3.12	0.0654	6.33	0.6367	0.0241	2.96	0.0573	5.57
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	1,3,5-Trimethylbenzene	0.09600	0.3240	0.0123	2.93	0.0560	5.44	0.0258	0.0010	0.80	0.0090	0.90
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-EW6	Naphthalene	0.12000	0.3800	0.0144	2.88	0.0541	5.27	0.1543	0.0059	2.13	0.0314	3.09

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Smith et al., 1981 Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr	Hughes et al., 1984 Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	Benzene	0.00510	0.4949	0.0188	3.75	0.1739	15.96	0.5061	0.0192	3.75	0.1747	16.03
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	Toluene	0.30000	1.0300	0.0391	2.94	0.0565	5.49	1.4207	0.0539	3.13	0.0662	6.41
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	Ethylbenzene	0.21000	0.1600	0.0061	1.64	0.0215	2.12	0.5469	0.0207	2.74	0.0486	4.75
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	Total Xylenes (m,p, and o)	1.26000	1.0600	0.0402	1.73	0.0231	2.29	1.1003	0.0417	1.77	0.0238	2.35
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	Total BTEX	1.77510	2.7449	0.1041	2.30	0.0354	3.48	3.5740	0.1355	2.53	0.0418	4.10
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	1,2,3-Trimethylbenzene	0.11000	-0.1100	-0.0042	#DIV/0!	#DIV/0!	#DIV/0!	0.3401	0.0129	2.87	0.0534	5.20
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	1,2,4-Trimethylbenzene	0.30000	0.7100	0.0269	2.67	0.0460	4.50	0.5167	0.0196	2.40	0.0380	3.73
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	1,3,5-Trimethylbenzene	0.11000	0.3100	0.0118	2.80	0.0508	4.95	0.0118	0.0004	0.37	0.0039	0.39
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	CH-MW-103	Naphthalene	0.11000	0.3900	0.0148	2.96	0.0574	5.58	0.1643	0.0062	2.27	0.0346	3.41

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Smith et al., 1981 Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr	Hughes et al., 1984 Linear C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	Benzene	0.00200	0.4980	0.0189	3.78	0.2094	18.89	0.5092	0.0193	3.78	0.2102	18.96
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	Toluene	0.00200	1.3280	0.0504	3.79	0.2465	21.84	1.7187	0.0652	3.79	0.2562	22.60
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	Ethylbenzene	0.01700	0.3530	0.0134	3.62	0.1168	11.02	0.7399	0.0281	3.71	0.1439	13.41
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	Total Xylenes (m,p, and o)	0.04600	2.2740	0.0862	3.72	0.1487	13.81	2.3143	0.0878	3.72	0.1493	13.87
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	Total BTEX	0.06700	4.4530	0.1688	3.74	0.1597	14.76	5.2821	0.2003	3.74	0.1661	15.30
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	1,2,3-Trimethylbenzene	0.14000	-0.1400	-0.0053	#DIV/0!	#DIV/0!	#DIV/0!	0.3101	0.0118	2.61	0.0443	4.33
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	1,2,4-Trimethylbenzene	0.30000	0.7100	0.0269	2.67	0.0460	4.50	0.5167	0.0196	2.40	0.0380	3.73
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	1,3,5-Trimethylbenzene	0.06300	0.3570	0.0135	3.22	0.0719	6.94	0.0588	0.0022	1.83	0.0250	2.47
OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/1/1975	2/7/2002	W-108	Naphthalene	0.15000	0.3500	0.0133	2.65	0.0457	4.46	0.1243	0.0047	1.72	0.0229	2.26

TOTAL BTEX WEATHERING AT JP-4 SITES										
Data for comb_plot										
				First Order Total BTEX				First Order Benzene		
				y = 4.52e ^ -0.1783x		Percent		y = 0.5e ^ -0.3099x		Percent
						Reduction				Reduction
				Co	k1	per Year		Co	k1	per Year
		with eaker		4.52	0.1176	11.09		0.5	0.26	22.89
		without eaker		4.52	0.1329	**12.44**		0.5	0.2163	**19.45**
Time	Benzene	Total BTEX		Data Source						
0	0.50	4.52		Smith et al., 1981						
2.76	0.24	1.86		Average Shaw 1997 Data						
3.78	0.19	1.79		Average Shaw 1998 Data						
8.13	0.13	2.05		Average Shaw 2002 Data						
16.57	0.02	1.94		Seymour Johnson Average 7/24/01 data						
16.18	0.02	0.57		Average Myrtle Beach 1997 Data						
20.58	0.02	0.24		Average Myrtle Beach 2001 Data						
18.18	0.00	0.24		DFSP-Charleston EW6 (1993)						
19.59	0.09	1.22		DFSP-Charleston average 5/1/95 data						
21.64	0.00	0.27		Average DFSP-Charleston 1997 Data						
26.37	0.00	0.69		Average DFSP-Charleston 2/7/02 Data						
22.32	0.00	0.00		McChord AFB 1997 Data						
23.92	0.06	1.75		Average Eaker 1997 Data						
28.04	0.11	1.82		Average Eaker 2001 Data						

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Linear (Zero Order) Assumption

linear equation $C = C_o - kt$

summary statistics presented as follows

analyte	
k	C_o
sek	seC_o
r^2	seC
F stat.	df
ss_{regr}	ss_{resid}

k = zero order weathering rate; k = dC/dt or slope
sek = slope standard error value
Co = intercept or initial analyte concentration as calculated by regression analysis
seCo = standard error value for the constant C_o
r^2 = coefficient of determination
seC = standard error value of the estimated concentration C (i.e., a "standard deviation" for the regressi
F stat. = F statistic or F-observed value
df = degrees of freedom
ss_{regr} = the regression sum of squares
ss_{resid} = the residual sum of squares

Exponential (1st Order) Assumption

exponential equation $C = C_o e^{-kt}$

summary statistics presented as follows

analyte	
m	C_o
sek	seC_o
r^2	seC
F stat.	df
ss_{regr}	ss_{resid}
	$\ln C_o$

m = coefficient for statistics equation shown; note $m = e^{-kt}$, therefore, ln m = -k
sek = standard error value for the exponential rate constant k
Co = intercept or initial analyte concentration as calculated by regression analysis
seCo = standard error value for the constant C_o; compare to $\ln C_o$
r^2 = coefficient of determination
seC = standard error value of the estimated concentration C (i.e., a "standard deviation" for the regressi
F stat. = F statistic or F-observed value
df = degrees of freedom
ss_{regr} = the regression sum of squares
ss_{resid} = the residual sum of squares
$\ln C_o$ = natural log of Co for comparing to seCo

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

SHAW AFB, BLDG 1610

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	o-Xylene	m,p-Xylenes	Total Xylenes	Total BTEX
SHMW1610-2	6/1/1994	0.00	0.50	1.33	0.37	1.01	1.31	2.32	4.52
	3/6/1997	2.76	0.29	0.64	0.18	0.39	0.73	1.12	2.22
	3/11/1998	3.78	0.16	0.36	0.13	0.31	0.61	0.92	1.58
	7/18/2002	8.13	0.14	0.37	0.15			1.41	2.08

linear	Benzene	Toluene	Ethylbenzene	o-Xylene	m,p-Xylenes	Total Xylenes	Total BTEX
Co	0.4297	1.0789	0.2954	#VALUE!	#VALUE!	1.7763	3.5803
Predicted C - latest sample date	0.0842	0.1857	0.1018	#VALUE!	#VALUE!	1.0339	1.4056
linear rate constant (k) (slope)	0.0425	0.1098	0.0238	0.1935	0.1907	0.0913	0.2673
average yearly reduction (%)	9.88	10.18	8.06	#VALUE!	#VALUE!	5.14	7.47

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0425	0.4297	-0.1098	1.0789	-0.0238	0.2954	-0.0913	1.7763	-0.2673	3.5803
0.0173	0.0810	0.0550	0.2580	0.0155	0.0727	0.1124	0.5277	0.1987	0.9322
0.7518	0.1009	0.6660	0.3217	0.5411	0.0907	0.2478	0.6579	0.4752	1.1623
6	2	4	2	2	2	1	2	2	2
0.0617	0.0204	0.4127	0.2069	0.0194	0.0164	0.2852	0.8656	2.4465	2.7019

exponential	Benzene	Toluene	Ethylbenzene	o-Xylene	m,p-Xylenes	Total Xylenes	Total BTEX
Co	0.4235	1.0128	0.2735	#VALUE!	#VALUE!	1.6174	3.2843
exponential rate constant (k)	0.1547	0.1510	0.0980	#VALUE!	#VALUE!	0.0485	0.0860
% reduction/year	14.33	14.02	9.33	#VALUE!	#VALUE!	4.74	8.24

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.8567	0.4235	0.8598	1.0128	0.9067	0.2735	0.9526	1.6174	0.9176	3.2843
0.0550	0.2579	0.0700	0.3284	0.0653	0.3066	0.0762	0.3577	0.0716	0.3358
0.7984	0.3215	0.6996	0.4094	0.5291	0.3823	0.1684	0.4459	0.4196	0.4186
8	2	5	2	2	2	0	2	1	2
0.8191	0.2068	0.7808	0.3352	0.3284	0.2923	0.0805	0.3977	0.2534	0.3505
	-0.8591		0.0127		-1.2963		0.4808		1.1892

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

SHAW AFB, BLDG 1610 (continued)

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
SHMW1610-3	6/1/1994	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	2.32
	3/6/1997	2.76	0.18	0.32	0.12	0.41	0.31	0.15	0.57	0.87	1.49
	3/11/1998	3.78	0.21	0.42	0.14	0.45	0.32	0.17	0.61	0.93	1.70
	7/18/2002	8.13	0.15	0.33	0.15					1.28	1.92
linear											
Co			0.3982	0.9915	0.2771	#VALUE!	#VALUE!	#VALUE!	#VALUE!	1.7227	1.9744
Predicted C - latest sample date			0.0931	0.1276	0.0956	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.8970	1.7162
linear rate constant (k) (slope)			0.0375	0.1062	0.0223	0.1489	0.1989	0.0535	0.2024	0.1015	0.0317
average yearly reduction (%)			9.42	10.71	8.05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	5.89	1.61

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0375	0.3982	-0.1062	0.9915	-0.0223	0.2771	-0.1015	1.7227	-0.0317	1.9744
0.0209	0.0982	0.0691	0.3244	0.0188	0.0884	0.1209	0.5672	0.0710	0.3332
0.6163	0.1225	0.5414	0.4044	0.4124	0.1102	0.2607	0.7072	0.0908	0.4155
3	2	2	2	1	2	1	2	0	2
0.0482	0.0300	0.3861	0.3271	0.0170	0.0243	0.3528	1.0003	0.0345	0.3452

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.3717	0.8479	0.2413	#VALUE!	#VALUE!	#VALUE!	#VALUE!	1.5202	1.9276
exponential rate constant (k)	0.1289	0.1465	0.0877	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.0544	0.0137
% reduction/year	12.09	13.63	8.40	#VALUE!	#VALUE!	#VALUE!	#VALUE!	5.29	1.36

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.8791	0.3717	0.8637	0.8479	0.9160	0.2413	0.9471	1.5202	0.9864	1.9276
0.0631	0.2963	0.0945	0.4435	0.0869	0.4079	0.0856	0.4015	0.0383	0.1799
0.6758	0.3694	0.5459	0.5529	0.3374	0.5086	0.1681	0.5005	0.0601	0.2243
4	2	2	2	1	2	0	2	0	2
0.5688	0.2729	0.7350	0.6114	0.2634	0.5173	0.1012	0.5011	0.0064	0.1006
	-0.9896		-0.1650		-1.4216		0.4188		0.6563

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

DFSP-Charleston, Tank 1

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
EW-6	10/1/1975	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	4.52
	12/1/1993	18.18	0.0013	0.0057	0.0478	0.1328	0.0115	0.0428	0.1756	0.1871	0.2419
	5/17/1997	21.64	0.0000	0.0002	0.0115	0.0276	0.0027	0.0138	0.0415	0.0441	0.0558
	2/7/2002	26.37	0.0011	0.0011	0.0490		0.0011		0.1700	0.1711	0.2223
linear											
Co			0.4683	1.2463	0.3479	#VALUE!	0.9478	#VALUE!	1.2336	2.1814	4.2439
Predicted C - latest sample date			-0.0778	-0.2072	-0.0160	#VALUE!	-0.1542	#VALUE!	-0.0562	-0.2103	-0.5114
linear rate constant (k) (slope)			0.0207	0.0551	0.0138	0.0439	0.0418	0.0160	0.0489	0.0907	0.1803
average yearly reduction (%)			4.42	4.42	3.97	#VALUE!	4.41	#VALUE!	3.96	4.16	4.25

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0245	0.4927	-0.0652	1.3109	-0.0169	0.3681	-0.1092	2.2996	-0.2159	4.4713
0.0036	0.0593	0.0096	0.1562	0.0010	0.0159	0.0102	0.1666	0.0244	0.3981
0.9785	0.0598	0.9789	0.1574	0.9967	0.0160	0.9913	0.1679	0.9874	0.4010
46	1	46	1	304	1	114	1	78	1
0.1627	0.0036	1.1493	0.0248	0.0776	0.0003	3.2216	0.0282	12.5946	0.1608

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.2785	1.0627	0.3062	#VALUE!	1.0387	#VALUE!	1.0957	1.8957	3.5922
exponential rate constant (k)	0.3279	0.3115	0.1025	#VALUE!	0.2621	#VALUE!	0.1026	0.1251	0.1423
% reduction/year	27.96	26.77	9.74	#VALUE!	23.06	#VALUE!	9.75	11.76	13.26

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.6195	0.7310	0.6862	1.6114	0.8653	0.4010	0.8450	2.5005	0.8276	4.8507
0.1901	3.1026	0.0961	1.5678	0.0403	0.6575	0.0375	0.6119	0.0353	0.5767
0.8638	3.1258	0.9389	1.5795	0.9280	0.6624	0.9527	0.6165	0.9663	0.5811
6	1	15	1	13	1	20	1	29	1
61.9656	9.7706	38.3405	2.4947	5.6589	0.4387	7.6621	0.3801	9.6766	0.3376
	-0.3133		0.4771		-0.9138		0.9165		1.5791

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

DFSP-Charleston, Tank 1

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
MW103	10/1/1975	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	4.52
	5/16/1997	21.64	0.0000	0.0268	0.1263					0.7105	0.8637
	2/7/2002	26.37	0.0051	0.3000	0.2100		0.2800		0.9800	1.2600	1.7751
linear											
Co			0.4901	1.2818	0.3582	#VALUE!	#VALUE!	#VALUE!	#VALUE!	2.2421	4.3722
Predicted C - latest sample date			-0.0401	0.0796	0.1559	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.9041	1.0996
linear rate constant (k) (slope)			0.0201	0.0456	0.0077	#DIV/0!	0.0277	#DIV/0!	0.0125	0.0507	0.1241
average yearly reduction (%)			4.10	3.56	2.14	#VALUE!	#VALUE!	#VALUE!	#VALUE!	2.26	2.84

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0201	0.4901	-0.0456	1.2818	-0.0077	0.3582	-0.0507	2.2421	-0.1241	4.3722
0.0036	0.0712	0.0176	0.3474	0.0043	0.0853	0.0285	0.5611	0.0541	1.0650
0.9686	0.0719	0.8698	0.3508	0.7584	0.0861	0.7603	0.5665	0.8404	1.0752
31	1	7	1	3	1	3	1	5	1
0.1598	0.0052	0.8215	0.1230	0.0233	0.0074	1.0178	0.3209	6.0885	1.1561

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.2116	1.0030	0.3470	#VALUE!	#VALUE!	#VALUE!	#VALUE!	2.1592	4.1166
exponential rate constant (k)	0.2903	0.0947	0.0302	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.0329	0.0481
% reduction/year	25.20	9.03	2.97	#VALUE!	#VALUE!	#VALUE!	#VALUE!	3.23	4.70

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.7480	0.2116	0.9097	1.0030	0.9703	0.3470	0.9677	2.1592	0.9530	4.1166
0.3146	6.1963	0.1033	2.0336	0.0235	0.4627	0.0263	0.5176	0.0342	0.6737
0.4599	6.2557	0.4568	2.0531	0.6226	0.4671	0.6101	0.5226	0.6641	0.6801
1	1	1	1	2	1	2	1	2	1
33.3189	39.1335	3.5440	4.2151	0.3599	0.2182	0.4273	0.2731	0.9147	0.4626
	-1.5531		0.0030		-1.0585		0.7697		1.4150

DFSP-Charleston, Tank 1

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
W108	10/1/1975	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	4.52
	5/1/1995	19.59	0.0000	0.0027	0.0067	0.0063	0.0122	0.0068	0.0132	0.0254	0.0347

	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
	8/8/1997	21.87	0.0001	0.0032	0.0229	0.0216	0.0207	0.0098	0.0315	0.0521	0.0783
	2/7/2002	26.37	0.0020	0.0020	0.0170		0.0300		0.0160	0.0460	0.0670
linear											
Co			0.4778	1.2719	0.3534	#VALUE!	0.9641	#VALUE!	1.2536	2.2177	4.3208
Predicted C - latest sample date			-0.0700	-0.1859	-0.0342	#VALUE!	-0.1181	#VALUE!	-0.1630	-0.2811	-0.5712
linear rate constant (k) (slope)			0.0208	0.0553	0.0147	0.0452	0.0410	0.0163	0.0537	0.0947	0.1855
average yearly reduction (%)			4.35	4.35	4.16	#VALUE!	4.26	#VALUE!	4.28	4.27	4.29

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0239	0.4970	-0.0634	1.3221	-0.0169	0.3670	-0.1089	2.3049	-0.2132	4.4910
0.0023	0.0386	0.0061	0.1026	0.0023	0.0387	0.0115	0.1944	0.0221	0.3742
0.9910	0.0387	0.9910	0.1029	0.9821	0.0388	0.9890	0.1950	0.9894	0.3753
110	1	110	1	55	1	90	1	93	1
0.1651	0.0015	1.1635	0.0106	0.0827	0.0015	3.4318	0.0380	13.1417	0.1409

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	#REF!	1.0639	0.2876	#VALUE!	0.7502	#VALUE!	1.0837	1.8074	3.4518
exponential rate constant (k)	0.3059	0.2630	0.1307	#VALUE!	0.1567	#VALUE!	0.1765	0.1656	0.1777
% reduction/year	26.35	23.13	12.25	#VALUE!	14.51	#VALUE!	16.18	15.26	16.28

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.6239	0.3867	0.7470	1.2687	0.8542	0.3392	0.8221	2.1763	0.8105	4.2110
0.1957	3.3170	0.0360	0.6096	0.0662	1.1219	0.0487	0.8255	0.0539	0.9144
0.8532	3.3269	0.9850	0.6114	0.8500	1.1253	0.9418	0.8280	0.9382	0.9172
6	1	66	1	6	1	16	1	15	1
64.3509	11.0684	24.5973	0.3738	7.1759	1.2663	11.0885	0.6856	12.7618	0.8412
	-0.9500		0.2380		-1.0811		0.7776		1.4377

Myrtle Beach MW8I
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
MW8I	1/1/1981	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	4.52
	3/4/1997	16.18	0.0281	0.0010	0.1813	0.4587	0.0016	0.1080	0.5667	0.5683	0.7788
	7/25/2001	20.58	0.0260	0.0021	0.1700		0.0021		0.1600	0.1600	0.3581
linear											
Co			0.4932	1.3103	0.3681	#VALUE!	0.9951	#VALUE!	1.3306	2.3258	4.4974
Predicted C - latest sample date			-0.0097	-0.1015	0.1600	#VALUE!	-0.0763	#VALUE!	0.2681	0.1905	0.2393
linear rate constant (k) (slope)			0.0232	0.0652	0.0096	0.0276	0.0495	0.0133	0.0491	0.0987	0.1968
average yearly reduction (%)			4.71	4.98	2.61	#VALUE!	4.98	#VALUE!	3.69	4.24	4.37

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0247	0.4873	-0.0693	1.2935	-0.0102	0.3660	-0.1059	2.3132	-0.2101	4.4599
0.0050	0.0758	0.0144	0.2177	0.0016	0.0240	0.0027	0.0406	0.0237	0.3580
0.9604	0.0768	0.9586	0.2207	0.9766	0.0243	0.9994	0.0411	0.9874	0.3630
24	1	23	1	42	1	1556	1	79	1
0.1432	0.0059	1.1278	0.0487	0.0246	0.0006	2.6319	0.0017	10.3667	0.1318

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.4821	1.1296	0.3680	#VALUE!	0.8998	#VALUE!	1.4273	2.5071	4.6778
exponential rate constant (k)	0.1438	0.3302	0.0370	#VALUE!	0.3081	#VALUE!	0.0803	0.1083	0.1104
% reduction/year	13.39	28.12	3.63	#VALUE!	26.51	#VALUE!	7.72	10.27	10.45

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.8582	0.4658	0.7055	1.0139	0.9613	0.3652	0.8884	2.5369	0.8876	4.6586
0.0280	0.4225	0.1070	1.6165	0.0051	0.0776	0.0352	0.5323	0.0119	0.1799
0.9677	0.4284	0.9141	1.6391	0.9834	0.0787	0.9186	0.5398	0.9901	0.1824
30	1	11	1	59	1	11	1	100	1
5.4925	0.1835	28.5866	2.6867	0.3663	0.0062	3.2874	0.2913	3.3416	0.0333
	-0.7641		0.0138		-1.0073		0.9309		1.5387

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Myrtle Beach MW24
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
MW24	1/1/1981	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	4.52
	3/4/1997	16.18	0.0074	0.0007	0.0785	0.2369	0.0019	0.0410	0.2779	0.2797	0.3664
	7/25/2001	20.58	0.0120	0.0015	0.0760		0.0021		0.0310	0.0331	0.1226
linear											
Co			0.4924	1.3103	0.3659	#VALUE!	0.9951	#VALUE!	1.3139	2.3090	4.4776
Predicted C - latest sample date			-0.0281	-0.1019	0.0544	#VALUE!	-0.0762	#VALUE!	0.0516	-0.0247	-0.1003
linear rate constant (k) (slope)			0.0241	0.0653	0.0144	0.0398	0.0495	0.0170	0.0583	0.1078	0.2115
average yearly reduction (%)			4.88	4.98	3.93	#VALUE!	4.97	#VALUE!	4.44	4.67	4.72

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0255	0.4860	-0.0693	1.2935	-0.0153	0.3623	-0.1152	2.2890	-0.2254	4.4307
0.0055	0.0832	0.0144	0.2175	0.0030	0.0461	0.0122	0.1849	0.0352	0.5317
0.9556	0.0844	0.9587	0.2206	0.9618	0.0467	0.9888	0.1874	0.9762	0.5391
22	1	23	1	25	1	89	1	41	1
0.1532	0.0071	1.1286	0.0486	0.0549	0.0022	3.1160	0.0351	11.9258	0.2906

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.4523	1.1256	0.3625	#VALUE!	0.9116	#VALUE!	1.5178	2.6536	4.7414
exponential rate constant (k)	0.1921	0.3464	0.0771	#VALUE!	0.3055	#VALUE!	0.1440	0.1700	0.1573
% reduction/year	17.47	29.28	7.42	#VALUE!	26.33	#VALUE!	13.42	15.63	14.55

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.8165	0.4239	0.6934	1.0065	0.9212	0.3558	0.8303	2.7156	0.8437	4.7121
0.0651	0.9831	0.1098	1.6598	0.0154	0.2334	0.0621	0.9378	0.0164	0.2479
0.9067	0.9969	0.9175	1.6831	0.9658	0.2366	0.8999	0.9509	0.9908	0.2513
10	1	11	1	28	1	9	1	107	1
9.6565	0.9938	31.4921	2.8327	1.5802	0.0560	8.1262	0.9042	6.7784	0.0632
	-0.8582		0.0065		-1.0334		0.9990		1.5501

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Eaker
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
MW306	10/1/1973	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	4.52
	8/27/1997	23.92	0.0004	0.0000	0.3252	0.0695	0.2216	0.3842	0.4537	0.6753	1.0009
	10/10/2001	28.04	0.0012	0.0017	0.2500		0.0530		0.4800	0.5300	0.7829

linear	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.4938	1.3134	0.3748	#VALUE!	1.0123	#VALUE!	1.2975	2.3101	4.4921
Predicted C - latest sample date	-0.0350	-0.0944	0.2781	#VALUE!	0.0666	#VALUE!	0.4077	0.4725	0.6213
linear rate constant (k) (slope)	0.0189	0.0502	0.0035	0.0372	0.0337	-0.0014	0.0317	0.0655	0.1380
average yearly reduction (%)	3.82	3.82	0.92	#VALUE!	3.33	#VALUE!	2.45	2.84	3.07

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0189	0.4938	-0.0502	1.3134	-0.0035	0.3748	-0.0655	2.3101	-0.1380	4.4921
0.0026	0.0557	0.0070	0.1480	0.0020	0.0433	0.0042	0.0886	0.0117	0.2491
0.9811	0.0561	0.9812	0.1490	0.7424	0.0435	0.9960	0.0891	0.9929	0.2506
52	1	52	1	3	1	248	1	139	1
0.1630	0.0031	1.1556	0.0222	0.0055	0.0019	1.9688	0.0079	8.7364	0.0628

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.4188	0.7243	0.3764	#VALUE!	1.0983	#VALUE!	1.2877	2.3249	4.5154
exponential rate constant (k)	0.2454	0.3416	0.0110	#VALUE!	0.0907	#VALUE!	0.0387	0.0523	0.0627
% reduction/year	21.76	28.94	1.10	#VALUE!	8.68	#VALUE!	3.80	5.09	6.08

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.7824	0.4188	0.7106	0.7243	0.9890	0.3764	0.9491	2.3249	0.9392	4.5154
0.0744	1.5837	0.2553	5.4332	0.0073	0.1543	0.0009	0.0190	0.0004	0.0091
0.9158	1.5935	0.6416	5.4671	0.6981	0.1553	0.9997	0.0191	1.0000	0.0092
11	1	2	1	2	1	3445	1	21354	1
27.6217	2.5394	53.5163	29.8895	0.0557	0.0241	1.2535	0.0004	1.8023	0.0001
	-0.8703		-0.3226		-0.9770		0.8437		1.5075

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Eaker
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
MW316	10/1/1973	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	4.52
	8/27/1997	23.92	0.1168	0.0000	0.3842	1.1526	0.3115	0.5348	1.6874	1.9990	2.5000
	10/10/2001	28.04	0.2200	0.0008	0.4400		0.0560		2.1000	2.2000	2.8608

linear	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.4879	1.3135	0.3662	#VALUE!	1.0197	#VALUE!	1.2851	2.3016	4.4692
Predicted C - latest sample date	0.1496	-0.0949	0.4178	#VALUE!	0.1122	#VALUE!	1.9555	2.0934	2.5659
linear rate constant (k) (slope)	0.0121	0.0502	-0.0018	-0.0081	0.0324	-0.0077	-0.0239	0.0074	0.0679
average yearly reduction (%)	2.47	3.82	-0.50	#VALUE!	3.17	#VALUE!	-1.86	0.32	1.52

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0121	0.4879	-0.0502	1.3135	0.0018	0.3662	-0.0074	2.3016	-0.0679	4.4692
0.0051	0.1085	0.0069	0.1475	0.0016	0.0342	0.0077	0.1643	0.0214	0.4544
0.8485	0.1091	0.9813	0.1484	0.5679	0.0344	0.4805	0.1653	0.9099	0.4573
6	1	53	1	1	1	1	1	10	1
0.0667	0.0119	1.1565	0.0220	0.0016	0.0012	0.0253	0.0273	2.1121	0.2091

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.4693	0.7638	0.3666	#VALUE!	1.1258	#VALUE!	1.2937	2.2999	4.4439
exponential rate constant (k)	0.0401	0.3594	-0.0046	#VALUE!	0.0846	#VALUE!	-0.0147	0.0034	0.0192
% reduction/year	3.93	30.19	-0.46	#VALUE!	8.11	#VALUE!	-1.48	0.34	1.90

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.9607	0.4693	0.6981	0.7638	1.0046	0.3666	0.9966	2.2999	0.9810	4.4439
0.0266	0.5663	0.2330	4.9578	0.0039	0.0827	0.0037	0.0779	0.0071	0.1518
0.6945	0.5699	0.7041	4.9887	0.5828	0.0832	0.4611	0.0784	0.8789	0.1528
2	1	2	1	1	1	1	1	7	1
0.7381	0.3247	59.2292	24.8870	0.0097	0.0069	0.0053	0.0061	0.1694	0.0233
	-0.7565		-0.2694		-1.0035		0.8329		1.4915

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Seymour Johnson-AGE
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
MW13	1/1/1985	0.00	0.50	1.33	0.37	0.96	1.01	0.35	1.31	2.32	4.52
	7/24/2001	16.57	0.1298	0.4543	0.2985					0.9476	1.8302
	7/24/2001	16.57	0.0440	0.4800	0.0920		0.3700		0.8200	1.2000	1.8160
linear											
Co			0.5000	1.3300	0.3700	#VALUE!	#VALUE!	#VALUE!	#VALUE!	2.3200	4.5200
Predicted C - latest sample date			0.0869	0.4672	0.1953	#VALUE!	#VALUE!	#VALUE!	#VALUE!	1.0738	1.8231
linear rate constant (k) (slope)			0.0249	0.0521	0.0105	#DIV/0!	0.0386	#DIV/0!	0.0296	0.0752	0.1628
average yearly reduction (%)			4.99	3.92	2.85	#VALUE!	#VALUE!	#VALUE!	#VALUE!	3.24	3.60

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0249	0.5000	-0.0521	1.3300	-0.0105	0.3700	-0.0752	2.3200	-0.1628	4.5200
0.0045	0.0607	0.0013	0.0182	0.0108	0.1461	0.0132	0.1785	0.0007	0.0101
0.9687	0.0607	0.9993	0.0182	0.4883	0.1461	0.9701	0.1785	1.0000	0.0101
31	1	1504	1	1	1	32	1	47972	1
0.1138	0.0037	0.4963	0.0003	0.0204	0.0213	1.0354	0.0319	4.8488	0.0001

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.5000	1.3300	0.3700	#VALUE!	#VALUE!	#VALUE!	#VALUE!	2.3200	4.5200
exponential rate constant (k)	0.1140	0.0632	0.0485	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.0469	0.0548
% reduction/year	10.78	6.12	4.73	#VALUE!	#VALUE!	#VALUE!	#VALUE!	4.58	5.33

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.8922	0.5000	0.9388	1.3300	0.9527	0.3700	0.9542	2.3200	0.9467	4.5200
0.0565	0.7650	0.0029	0.0389	0.0615	0.8324	0.0123	0.1670	0.0004	0.0055
0.8027	0.7650	0.9979	0.0389	0.3830	0.8324	0.9352	0.1670	0.9999	0.0055
4	1	483	1	1	1	14	1	18073	1
2.3802	0.5852	0.7303	0.0015	0.4300	0.6928	0.4028	0.0279	0.5496	0.0000
	-0.6931		0.2852		-0.9943		0.8416		1.5085

Lab		Fuel	Spill	Sample				Beaufort MCAS Fresh JP-5					Hughes et al., 1984				
									Linear		Exponential			Linear		Exponential	
Code	Site Name	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	Benzene	0.00028	-0.0001	0.0000	-6.13	-0.0508	-5.21	-0.0003	0.0000	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	Toluene	0.00162	0.0031	0.0004	9.08	0.1472	13.69	-0.0016	-0.0002	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	Ethylbenzene	0.01442	0.0275	0.0038	9.11	0.1482	13.77	-0.0144	-0.0020	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	Total Xylenes (m,p, and o)	0.07591	0.1635	0.0227	9.48	0.1594	14.74	-0.0558	-0.0077	-38.50	-0.1844	-20.24
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	Total BTEX	0.09222	0.1939	0.0269	9.41	0.1572	14.55	-0.0721	-0.0100	-49.76	-0.2114	-23.54
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	1,2,3-Trimethylbenzene	0.21134	0.0951	0.0132	4.31	0.0516	5.03	0.3555	0.0494	8.71	0.1370	12.80
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	1,2,4-Trimethylbenzene	0.25609	0.2785	0.0387	7.23	0.1022	9.71	0.2457	0.0341	6.80	0.0934	8.92
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	1,3,5-Trimethylbenzene	0.10641	0.0346	0.0048	3.41	0.0391	3.83	0.0380	0.0053	3.65	0.0424	4.15
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	Naphthalene	0.05656	0.0637	0.0088	7.35	0.1047	9.94	0.8298	0.1152	13.00	0.3820	31.75
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	1-MethylNaphthalene	0.16037	0.0666	0.0092	4.07	0.0482	4.71	0.1059	0.0147	5.52	0.0704	6.80
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	2-MethylNaphthalene	0.18647	0.1084	0.0150	5.10	0.0636	6.16	0.2656	0.0369	8.16	0.1229	11.57
NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	6/1/1990	8/12/1997	BFT-401-3	Total Naphthalenes	0.4034	0.2386	0.0331	5.16	0.0645	6.25	1.2013	0.1668	10.39	0.1917	17.44

Lab	Fuel	Spill	Sample				Beaufort MCAS Fresh JP-5					Hughes et al., 1984				
							Linear			Exponential		Linear			Exponential	
Code	Type	Date	Date	Locid	Analyte	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	Benzene	0.0052	-0.0050	-0.0002	-125.77	-0.1593	-17.26	-0.0052	-0.0003	#DIV/0!	#DIV/0!	#DIV/0!
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	Toluene	0.0052	-0.0005	0.0000	-0.55	-0.0052	-0.52	-0.0052	-0.0003	#DIV/0!	#DIV/0!	#DIV/0!
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	Ethylbenzene	0.0120	0.0299	0.0014	3.45	0.0604	5.86	-0.0120	-0.0006	#DIV/0!	#DIV/0!	#DIV/0!
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	Total Xylenes (m,p, and o)	0.1000	0.1394	0.0067	2.81	0.0422	4.13	-0.0799	-0.0039	-19.18	-0.0775	-8.05
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	Total BTEX	0.1224	0.1637	0.0079	2.76	0.0410	4.02	-0.1023	-0.0049	-24.56	-0.0872	-9.11
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	1,2,3-Trimethylbenzene	0.1800	0.1264	0.0061	1.99	0.0257	2.54	0.3869	0.0187	3.30	0.0554	5.39
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	1,2,4-Trimethylbenzene	0.1500	0.3846	0.0186	3.47	0.0614	5.95	0.3518	0.0170	3.39	0.0583	5.67
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	1,3,5-Trimethylbenzene	0.1000	0.0410	0.0020	1.41	0.0166	1.65	0.0444	0.0021	1.48	0.0177	1.76
OBG	JP-5	6/1/1981	2/8/2002	CEF-VEW-1	Naphthalene	0.0740	0.0463	0.0022	1.86	0.0235	2.32	0.8124	0.0392	4.43	0.1199	11.30
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	Benzene	0.0029	-0.0027	-0.0002	-89.46	-0.1707	-18.61	-0.0029	-0.0002	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	Toluene	0.0153	-0.0106	-0.0007	-14.22	-0.0742	-7.70	-0.0153	-0.0010	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	Ethylbenzene	0.3154	-0.2735	-0.0171	-40.83	-0.1263	-13.46	-0.3154	-0.0197	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	Total Xylenes (m,p, and o)	0.5991	-0.3598	-0.0225	-9.41	-0.0574	-5.91	-0.5790	-0.0362	-180.12	-0.2124	-23.66
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	Total BTEX	0.9327	-0.6466	-0.0405	-14.14	-0.0740	-7.68	-0.9126	-0.0571	-283.90	-0.2401	-27.14
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	1,2,3-Trimethylbenzene	0.2328	0.0736	0.0046	1.50	0.0172	1.71	0.3341	0.0209	3.69	0.0557	5.42
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	1,2,4-Trimethylbenzene	0.5006	0.0340	0.0021	0.40	0.0041	0.41	0.0011	0.0001	0.01	0.0001	0.01
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	1,3,5-Trimethylbenzene	0.1752	-0.0342	-0.0021	-1.52	-0.0136	-1.37	-0.0308	-0.0019	-1.34	-0.0121	-1.22
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	Naphthalene	0.2353	-0.1150	-0.0072	-5.99	-0.0420	-4.29	0.6511	0.0407	4.60	0.0830	7.97
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	1-MethylNaphthalene	0.2866	-0.0597	-0.0037	-1.65	-0.0146	-1.47	-0.0203	-0.0013	-0.48	-0.0046	-0.46
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	2-MethylNaphthalene	0.4155	-0.1206	-0.0076	-2.56	-0.0379	-3.86	0.0366	0.0023	0.51	0.0053	0.53
NRMRL	JP-5	6/1/1981	5/20/1997	CEF-293-9FP	Total Naphthalenes	0.9374	-0.2954	-0.0185	-2.88	-0.1285	-13.71	0.6673	0.0418	2.60	0.0336	3.31

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Cecil Field 293-9/VEW-1
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylene	Total Xylen	Total BTEX
MW293-9/VEW-1	6/1/1981	0.00	0.0002	0.0047	0.0419	0.0977	0.1010	0.0406	0.1383	0.2394	0.2861
	5/20/1997	15.98	0.0029	0.0153	0.3154	0.3504	0.0397	0.2090	0.5594	0.5991	0.9327
	2/8/2002	20.70	0.0052	0.0052	0.0120		0.0550		0.0450	0.1000	0.1224
linear											
Co			0.0000	0.0061	0.0830	#VALUE!	0.0974	#VALUE!	0.2067	0.3041	0.3932
Predicted C - latest sample date			0.0047	0.0100	0.1509	#VALUE!	0.0429	#VALUE!	0.2760	0.3189	0.4844
linear rate constant (k) (slope)			-0.0002	-0.0002	-0.0033	-0.0158	0.0026	-0.0105	-0.0033	-0.0007	-0.0044
average yearly reduction (%)			-593.85	-3.09	-3.95	#VALUE!	2.70	#VALUE!	-1.62	-0.23	-1.12

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.0002	0.0000	0.0002	0.0061	0.0033	0.0830	0.0007	0.3041	0.0044	0.3932
0.0001	0.0009	0.0005	0.0078	0.0151	0.2274	0.0237	0.3583	0.0392	0.5926
0.9399	0.0009	0.1167	0.0079	0.0453	0.2310	0.0009	0.3641	0.0124	0.6022
16	1	0	1	0	1	0	1	0	1
0.0000	0.0000	0.0000	0.0001	0.0025	0.0534	0.0001	0.1325	0.0046	0.3626

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylene	Total Xylen	Total BTEX
Co	0.0002	0.0054	0.0634	#VALUE!	0.0947	#VALUE!	0.1893	0.2984	0.3691
exponential rate constant (k)	-0.1622	-0.0228	0.0129	#VALUE!	0.0368	#VALUE!	0.0182	0.0168	0.0118
% reduction/year	-17.61	-2.30	1.28	#VALUE!	3.61	#VALUE!	1.80	1.67	1.17

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
1.1761	0.0002	1.0230	0.0054	0.9872	0.0634	0.9833	0.2984	0.9883	0.3691
0.0093	0.1402	0.0559	0.8447	0.1515	2.2871	0.0808	1.2198	0.0933	1.4083
0.9967	0.1424	0.1422	0.8584	0.0072	2.3242	0.0415	1.2395	0.0156	1.4311
305	1	0	1	0	1	0	1	0	1
6.1918	0.0203	0.1222	0.7369	0.0391	5.4018	0.0665	1.5364	0.0325	2.0480
	-8.5311		-5.2147		-2.7586		-1.2094		-0.9968

									Smith et al., 1981					Mayfield, 1996				
										Linear		Exponential			Linear		Exponential	
Lab Code	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Results	Units	Mass Fraction	C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	Density	0.793	g/mL	0.0001										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	Benzene	0.025	ug/mL	0.0000	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!	0.0321	0.1096	341.09	31.4846	100.00
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	Toluene	0.025	ug/mL	0.0000	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!	0.2083	0.7107	341.12	37.8600	100.00
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	Ethylbenzene	63	ug/mL	0.0079	-0.0079	-0.0271	#DIV/0!	#DIV/0!	#DIV/0!	0.1432	0.4886	323.20	10.0496	100.00
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	m-Xylene	441	ug/mL	0.0556	0.0044	0.0150	24.95	0.2591	22.82	-0.0556	-0.1897	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	o-Xylene	453	ug/mL	0.0571	0.0029	0.0098	16.35	0.1675	15.42	0.3536	1.2062	293.68	6.7292	99.88
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	p-Xylene	111	ug/mL	0.0140	-0.0140	-0.0477	#DIV/0!	#DIV/0!	#DIV/0!	-0.0140	-0.0477	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	m,p-xylenes	552	ug/mL	0.0696	-0.0096	-0.0328	-54.63	-0.5067	-65.99	0.6506	2.2194	308.15	7.9709	99.97
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	Total Xylenes (m,p, and o)	1005	ug/mL	0.1267	-0.0067	-0.0230	-19.14	-0.1862	-20.47	1.0042	3.4256	302.90	7.4662	99.94
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	Total BTEX	1068.05	ug/mL	0.1347	-0.0147	-0.0501	-41.74	-0.3938	-48.26	1.3879	4.7345	310.95	8.2731	99.97
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	B+T	0.05	ug/mL	0.0000										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	E+X	1068	ug/mL	0.1347										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	B/T	1		0.0001										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	B/E	0.000396825		0.0000										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	B/X	2.48756E-05		0.0000										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	T/E	0.000396825		0.0000										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	T/X	2.48756E-05		0.0000										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	E/X	0.062686567		0.0000										
NRMRL	JP-8	4/1/1996	7/17/1996	SOURCE AREA	(B+T)/(E+X)	4.68165E-05		0.0000										

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Smith et al., 1981					Mayfield, 1996				
								Linear			Exponential		Linear			Exponential	
								C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	Benzene	0.03102	-0.0310	-0.0505	#DIV/0!	#DIV/0!	#DIV/0!	0.0011	0.0018	5.68	0.0579	5.62
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	Toluene	0.20567	-0.2057	-0.3351	#DIV/0!	#DIV/0!	#DIV/0!	0.0027	0.0043	2.08	0.0209	2.07
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	Ethylbenzene	0.15624	-0.1562	-0.2546	#DIV/0!	#DIV/0!	#DIV/0!	-0.0051	-0.0082	-5.44	-0.0536	-5.50
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	Total Xylenes (m,p, and o)	0.94918	-0.8292	-1.3511	-1125.93	-3.3699	-2807.58	0.1818	0.2962	26.19	0.2855	24.84
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	Total BTEX	1.34212	-1.2221	-1.9914	-1659.50	-3.9344	-5012.95	0.1805	0.2941	19.32	0.2056	18.58
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	1,2,3-Trimethylbenzene	NA										
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	1,2,4-Trimethylbenzene	NA										
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	1,3,5-Trimethylbenzene	NA										
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/12/1996	SJMW1S	Naphthalene	NA										

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Linear			Exponential		Linear			Exponential	
								C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	Benzene	0.02455	-0.0245	-0.0169	#DIV/0!	#DIV/0!	#DIV/0!	0.0076	0.0052	16.24	0.1853	16.91
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	Toluene	0.13307	-0.1331	-0.0915	#DIV/0!	#DIV/0!	#DIV/0!	0.0753	0.0517	24.83	0.3081	26.52
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	Ethylbenzene	0.14987	-0.1499	-0.1030	#DIV/0!	#DIV/0!	#DIV/0!	0.0013	0.0009	0.60	0.0060	0.60
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	Total Xylenes (m,p, and o)	0.78165	-0.6617	-0.4548	-379.01	-1.2881	-262.59	0.3493	0.2401	21.23	0.2539	22.42
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	Total BTEX	1.08915	-0.9691	-0.6662	-555.15	-1.5161	-355.46	0.4335	0.2980	19.57	0.2303	20.57
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	1,2,3-Trimethylbenzene	0.35530	-0.3553	-0.2442	#DIV/0!	#DIV/0!	#DIV/0!	0.3185	0.2189	32.49	0.4399	35.59
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	1,2,4-Trimethylbenzene	0.72997	-0.4600	-0.3162	-117.10	-0.6837	-98.11	0.7343	0.5048	34.47	0.4785	38.03
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	1,3,5-Trimethylbenzene	0.27519	-0.2752	-0.1892	#DIV/0!	#DIV/0!	#DIV/0!	0.2331	0.1603	31.53	0.4218	34.41
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	Naphthalene	0.16667	0.9733	0.6691	58.69	1.3217	73.33	0.0881	0.0606	23.77	0.2917	25.30
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	1-MethylNaphthalene	0.19251	1.6475	1.1325	61.55	1.5517	78.81	0.2349	0.1614	37.78	0.5482	42.20
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	2-MethylNaphthalene	0.29974	1.1603	0.7975	54.63	1.0883	66.32	0.0550	0.0378	10.66	0.1158	10.94
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW2SFP	Total Naphthalenes	0.65891	3.7811	2.5991	58.54	1.3114	73.06	0.3780	0.2598	25.06	0.3117	26.78

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Linear			Exponential		Linear			Exponential	
								C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	Benzene	0.02446	-0.0245	-0.0168	#DIV/0!	#DIV/0!	#DIV/0!	0.0077	0.0053	16.42	0.1876	17.11
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	Toluene	0.12989	-0.1299	-0.0893	#DIV/0!	#DIV/0!	#DIV/0!	0.0784	0.0539	25.88	0.3248	27.73
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	Ethylbenzene	0.14754	-0.1475	-0.1014	#DIV/0!	#DIV/0!	#DIV/0!	0.0036	0.0025	1.66	0.0168	1.67
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	Total Xylenes (m,p, and o)	0.75536	-0.6354	-0.4367	-363.95	-1.2646	-254.16	0.3756	0.2582	22.83	0.2774	24.23
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	Total BTEX	1.05725	-0.9373	-0.6442	-536.87	-1.4957	-346.25	0.4654	0.3199	21.01	0.2507	22.18
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	1,2,3-Trimethylbenzene	0.34300	-0.3430	-0.2358	#DIV/0!	#DIV/0!	#DIV/0!	0.3308	0.2274	33.75	0.4641	37.13
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	1,2,4-Trimethylbenzene	0.70492	-0.4349	-0.2990	-110.72	-0.6597	-93.41	0.7594	0.5220	35.65	0.5025	39.50
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	1,3,5-Trimethylbenzene	0.26482	-0.2648	-0.1820	#DIV/0!	#DIV/0!	#DIV/0!	0.2435	0.1674	32.93	0.4482	36.12
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	Naphthalene	0.16141	0.9786	0.6727	59.01	1.3437	73.91	0.0933	0.0642	25.19	0.3137	26.93
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	1-MethylNaphthalene	0.19042	1.6496	1.1339	61.62	1.5592	78.97	0.2370	0.1629	38.11	0.5557	42.63
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	2-MethylNaphthalene	0.28878	1.1712	0.8051	55.14	1.1139	67.17	0.0660	0.0454	12.79	0.1415	13.19
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	5/15/1997	SJMW1SFP	Total Naphthalenes	0.64061	3.7994	2.6116	58.82	1.3308	73.57	0.3963	0.2724	26.27	0.3310	28.18

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Linear			Exponential		Linear			Exponential	
								C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	Benzene	0.00602	-0.0060	-0.0026	#DIV/0!	#DIV/0!	#DIV/0!	0.0261	0.0115	35.74	0.7365	52.12
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	Toluene	0.07857	-0.0786	-0.0346	#DIV/0!	#DIV/0!	#DIV/0!	0.1298	0.0571	27.39	0.4288	34.87
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	Ethylbenzene	0.10468	-0.1047	-0.0460	#DIV/0!	#DIV/0!	#DIV/0!	0.0465	0.0205	13.53	0.1617	14.93
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	Total Xylenes (m,p, and o)	0.39557	-0.2756	-0.1212	-100.99	-0.5246	-68.97	0.7354	0.3234	28.59	0.4620	37.00
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	Total BTEX	0.58484	-0.4648	-0.2044	-170.35	-0.6965	-100.67	0.9378	0.4124	27.08	0.4208	34.35
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	1,2,3-Trimethylbenzene	0.28695	-0.2869	-0.1262	#DIV/0!	#DIV/0!	#DIV/0!	0.3869	0.1701	25.25	0.3754	31.30
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	1,2,4-Trimethylbenzene	0.53941	-0.2694	-0.1185	-43.88	-0.3043	-35.57	0.9249	0.4067	27.78	0.4392	35.54
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	1,3,5-Trimethylbenzene	0.14163	-0.1416	-0.0623	#DIV/0!	#DIV/0!	#DIV/0!	0.3667	0.1613	31.72	0.5620	42.99
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	Naphthalene	0.10825	1.0317	0.4537	39.80	1.0353	64.49	0.1465	0.0644	25.29	0.3764	31.37
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	1-MethylNaphthalene	0.15887	1.6811	0.7393	40.18	1.0772	65.94	0.2685	0.1181	27.63	0.4352	35.29
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	2-MethylNaphthalene	0.23399	1.2260	0.5391	36.93	0.8052	55.30	0.1208	0.0531	14.97	0.1830	16.72
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MP2	Total Naphthalenes	0.50111	3.9389	1.7322	39.01	0.9594	61.69	0.5358	0.2356	22.72	0.3198	27.37

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Linear			Exponential		Linear			Exponential	
								C_o - C	k	%Red./yr	k	%Red./yr	C_o - C	k	%Red./yr	k	%Red./yr
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	Benzene	0.00577	-0.0058	-0.0025	#DIV/0!	#DIV/0!	#DIV/0!	0.0264	0.0116	36.08	0.7553	53.01
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	Toluene	0.07359	-0.0736	-0.0324	#DIV/0!	#DIV/0!	#DIV/0!	0.1347	0.0593	28.44	0.4576	36.72
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	Ethylbenzene	0.09780	-0.0978	-0.0430	#DIV/0!	#DIV/0!	#DIV/0!	0.0534	0.0235	15.53	0.1916	17.43
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	Total Xylenes (m,p, and o)	0.37164	-0.2516	-0.1107	-92.22	-0.4971	-64.40	0.7593	0.3339	29.53	0.4894	38.70
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	Total BTEX	0.54880	-0.4288	-0.1886	-157.14	-0.6685	-95.14	0.9738	0.4282	28.13	0.4488	36.16
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	1,2,3-Trimethylbenzene	0.27384	-0.2738	-0.1204	#DIV/0!	#DIV/0!	#DIV/0!	0.4000	0.1759	26.10	0.3960	32.70
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	1,2,4-Trimethylbenzene	0.51222	-0.2422	-0.1065	-39.45	-0.2816	-32.52	0.9521	0.4187	28.59	0.4619	36.99
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	1,3,5-Trimethylbenzene	0.13325	-0.1333	-0.0586	#DIV/0!	#DIV/0!	#DIV/0!	0.3751	0.1649	32.45	0.5888	44.50
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	Naphthalene	0.10318	1.0368	0.4560	40.00	1.0564	65.23	0.1516	0.0667	26.17	0.3975	32.80
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	1-MethylNaphthalene	0.15281	0.1172	0.0515	19.09	0.2503	22.14	1.3115	0.5767	39.39	0.9938	62.98
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	2-MethylNaphthalene	0.22372	-0.2237	-0.0984	#DIV/0!	#DIV/0!	#DIV/0!	0.2846	0.1252	24.62	0.3609	30.30
NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	3/10/1998	SJ98-MW1S	Total Naphthalenes	0.47971	0.6603	0.2904	25.47	0.3807	31.66	-0.2249	-0.0989	-38.83	-0.2783	-32.09

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr	C_o - C	Linear k	Linear %Red./yr	Exponential k	Exponential %Red./yr
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	Benzene	0.04800	-0.0480	-0.0085	#DIV/0!	#DIV/0!	#DIV/0!	-0.0159	-0.0028	-8.73	-0.0710	-7.36
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	Toluene	0.04700	-0.0470	-0.0083	#DIV/0!	#DIV/0!	#DIV/0!	0.1613	0.0286	13.71	0.2636	23.17
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	Ethylbenzene	0.15000	-0.1500	-0.0266	#DIV/0!	#DIV/0!	#DIV/0!	0.0012	0.0002	0.14	0.0014	0.14
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	Total Xylenes (m,p, and o)	0.57000	-0.4500	-0.0797	-66.38	-0.2758	-31.76	0.5610	0.0993	8.78	0.1213	11.42
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	Total BTEX	0.81500	-0.6950	-0.1230	-102.52	-0.3391	-40.37	0.7076	0.1253	8.23	0.1106	10.47
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	1,2,3-Trimethylbenzene	0.19000	-0.1900	-0.0336	#DIV/0!	#DIV/0!	#DIV/0!	0.4838	0.0856	12.71	0.2241	20.08
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	1,2,4-Trimethylbenzene	0.78000	-0.5100	-0.0903	-33.44	-0.1878	-20.66	0.6843	0.1211	8.27	0.1115	10.55
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	1,3,5-Trimethylbenzene	0.22000	-0.2200	-0.0389	#DIV/0!	#DIV/0!	#DIV/0!	0.2883	0.0510	10.04	0.1482	13.78
OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/1/1995	7/24/2001	SJMW (18' from 1)	Naphthalene	0.12000	1.0200	0.1806	15.84	0.3985	32.87	0.1348	0.0239	9.36	0.1333	12.48

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-8 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Linear (Zero Order) Assumption

linear equation $C = C_o - kt$

summary statistics presented as follows

analyte	
k	C_o
sek	seC_o
r^2	seC
F stat.	df
ss_{regr}	ss_{resid}

k = zero order weathering rate; k = dC/dt or slope
sek = slope standard error value
Co = intercept or initial analyte concentration as calculated by regression analysis
seCo = standard error value for the constant C_o
r^2 = coefficient of determination
seC = standard error value of the estimated concentration C (i.e., a "standard deviation" for the regression line)
F stat. = F statistic or F-observed value
df = degrees of freedom
ss_{regr} = the regression sum of squares
ss_{resid} = the residual sum of squares

Exponential (1st Order) Assumption

exponential equation $C = C_o e^{-kt}$

summary statistics presented as follows

analyte	
m	C_o
sek	seC_o
r^2	seC
F stat.	df
ss_{regr}	ss_{resid}
	$\ln C_o$

m = coefficient for statistics equation shown; note $m = e^{-kt}$, therefore, ln m = -k
sek = standard error value for the exponential rate constant k
Co = intercept or initial analyte concentration as calculated by regression analysis
seCo = standard error value for the constant C_o; compare to $\ln C_o$
r^2 = coefficient of determination
seC = standard error value of the estimated concentration C (i.e., a "standard deviation" for the regression line)
F stat. = F statistic or F-observed value
df = degrees of freedom
ss_{regr} = the regression sum of squares
ss_{resid} = the residual sum of squares
$\ln C_o$ = natural log of Co for comparing to seCo

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-8 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

SEYMOUR JOHNSON AFB, BLDG 4522

Evergreen Analytical Data

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	O-xylene	M,P-xylenes	Total Xylenes	Total BTEX
MW-2S	12/1/1995	0.00	0.0321	0.2083	0.1512	0.4107	0.7202	1.1310	1.5226
	5/15/1997	1.45	0.0245	0.1331	0.1499	0.23	0.55	0.7817	1.0891
	3/10/1998	2.27	0.0060	0.0786	0.1047	0.1367	0.2589	0.3956	0.3956

linear	Benzene	Toluene	Ethylbenzene	O-xylene	M,P-xylenes	Total Xylenes	Total BTEX
Co	0.0343	0.2101	0.1578	0.4091	0.7502	1.1593	1.5899
Predicted C - latest sample date	0.0098	0.0818	0.1165	0.1339	0.3120	0.4459	0.5151
linear rate constant (k) (slope)	0.0108	0.0564	0.0182	0.1210	0.1927	0.3137	0.4727
average yearly reduction (%)	31.39	26.86	11.52	29.58	25.68	27.06	29.73

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0108	0.0343	-0.0564	0.2101	-0.0182	0.1578	-0.3137	1.1593	-0.4727	1.5899
0.0045	0.0070	0.0038	0.0060	0.0141	0.0219	0.0600	0.0935	0.1423	0.2218
0.8505	0.0073	0.9954	0.0063	0.6254	0.0229	0.9647	0.0977	0.9169	0.2318
6	1	216	1	2	1	27	1	11	1
0.0003	0.0001	0.0085	0.0000	0.0009	0.0005	0.2611	0.0095	0.5927	0.0537

exponential	Benzene	Toluene	Ethylbenzene	O-xylene	M,P-xylenes	Total Xylenes	Total BTEX
Co	0.0388	0.2171	0.1594	0.4222	0.7891	1.2140	1.7226
exponential rate constant (k)	0.6724	0.4148	0.1436	0.4743	0.4188	0.4378	0.5506
% reduction/year	48.95	33.95	13.38	37.77	34.22	35.45	42.34

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.5105	0.0388	0.6605	0.2171	0.8662	0.1594	0.6455	1.2140	0.5766	1.7226
0.3968	0.6185	0.0869	0.1355	0.1121	0.1747	0.1498	0.2335	0.2609	0.4067
0.7417	0.6464	0.9579	0.1416	0.6215	0.1825	0.8952	0.2440	0.8166	0.4250
3	1	23	1	2	1	9	1	4	1
1.1995	0.4178	0.4564	0.0200	0.0547	0.0333	0.5084	0.0595	0.8043	0.1806
	-3.2499		-1.5275		-1.8362		0.1939		0.5438

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-8 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

SEYMOUR JOHNSON AFB, BLDG 4522 (continued)
NRMRL Data

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	o-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
MW-1S	12/1/1995	0.00	0.0321	0.2083	0.1512	0.4107	0.7202	1.1310	1.1310
	7/12/1996	0.61	0.0310	0.2057	0.1562	0.2917	0.6575	0.9492	1.3421
	5/15/1997	1.45	0.0245	0.1299	0.1475	0.2219	0.5334	0.7554	1.0573
	3/10/1998	2.27	0.0058	0.0736	0.0978	0.1271	0.2445	0.3716	0.5488
	7/24/2001	5.65	0.0480	0.0470	0.1500	0.1500	0.5400	0.5700	0.8150

linear	Benzene	Toluene	Ethylbenzene	o-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.0357	0.1920	0.1430	0.3180	0.6003	0.9390	1.1384
Predicted C - latest sample date	0.0098	0.0250	0.1361	0.0983	0.4273	0.4201	0.6872
linear rate constant (k) (slope)	0.0114	0.0296	0.0012	0.0389	0.0306	0.0919	0.0799
average yearly reduction (%)	31.92	15.40	0.86	12.23	5.10	9.78	7.02

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.0029	0.0225	-0.0296	0.1920	-0.0012	0.1430	-0.0919	0.9390	-0.0799	1.1384
0.0036	0.0102	0.0090	0.0253	0.0062	0.0176	0.0575	0.1619	0.0649	0.1826
0.1736	0.0160	0.7831	0.0398	0.0127	0.0277	0.4593	0.2548	0.3353	0.2875
1	3	11	3	0	3	3	3	2	3
0.0002	0.0008	0.0171	0.0047	0.0000	0.0023	0.1655	0.1948	0.1251	0.2479

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylenes	Total BTEX
Co	0.0423	0.1986	0.1412	0.3036	0.3036	0.8929	0.5643	0.8929	1.1011
exponential rate constant (k)	0.7204	0.2778	0.0092	0.1628	0.1628	0.1196	0.0540	0.1196	0.0814
% reduction/year	51.34	24.26	0.92	15.02	15.02	11.28	5.26	11.28	7.82

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
1.0625	0.0206	0.7574	0.1986	0.9908	0.1412	0.8872	0.8929	0.9218	1.1011
0.2097	0.5899	0.0571	0.1606	0.0508	0.1430	0.0914	0.2570	0.0777	0.2185
0.0271	0.9285	0.8876	0.2528	0.0109	0.2251	0.3638	0.4045	0.2679	0.3439
0	3	24	3	0	3	2	3	1	3
0.0720	2.5863	1.5137	0.1917	0.0017	0.1520	0.2807	0.4910	0.1299	0.3548
	-3.8836		-1.6164		-1.9578		-0.1132		0.0963

Lab Code	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Ghassemi *et al*., 1984 Linear C_o - C	Ghassemi Linear k	Ghassemi Linear %Red./yr	Ghassemi Exponential k	Ghassemi Exponential %Red./yr	Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987) Linear C_o - C	Mid-Range Linear k	Mid-Range Linear %Red./yr	Mid-Range Exponential k	Mid-Range Exponential %Red./yr
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	Benzene	1.12195	0.3780	0.0848	5.65	0.0651	6.30	1.5780	0.3538	13.10	0.1969	17.87
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	Toluene	5.56911	0.3309	0.0742	1.26	0.0129	1.29	6.9309	1.5539	12.43	0.1813	16.58
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	Ethylbenzene	1.39566	-0.0957	-0.0214	-1.65	-0.0159	-1.60	0.3043	0.0682	4.01	0.0442	4.33
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	Total Xylenes (m,p, and o)	5.70190	0.1981	0.0444	0.75	0.0077	0.76	1.8981	0.4256	2.36	0.0644	6.24
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	Total BTEX	13.78862	0.8114	0.1819	1.25	0.0128	1.27	10.7114	2.4015	9.80	0.1289	12.09
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	1,2,3-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	1,2,4-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	1,3,5-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-1	Naphthalene	0.25068	0.1893	0.0424	9.65	0.1261	11.85	0.1393	0.0312	8.01	0.0991	9.43

	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Ghassemi *et al*., 1984 Linear C_o - C	Ghassemi Linear k	Ghassemi Linear %Red./yr	Ghassemi Exponential k	Ghassemi Exponential %Red./yr	Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987) Linear C_o - C	Mid-Range Linear k	Mid-Range Linear %Red./yr	Mid-Range Exponential k	Mid-Range Exponential %Red./yr
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	Benzene	0.76255	0.7374	0.1653	11.02	0.1517	14.07	1.9374	0.4344	16.09	0.2835	24.68
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	Toluene	3.88060	2.0194	0.4528	7.67	0.0939	8.97	8.6194	1.9325	15.46	0.2623	23.07
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	Ethylbenzene	1.25645	0.0436	0.0098	0.75	0.0076	0.76	0.4436	0.0994	5.85	0.0678	6.55
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	Total Xylenes (m,p, and o)	5.68792	0.2121	0.0475	0.81	0.0082	0.82	1.9121	0.4287	2.38	0.0650	6.29
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	Total BTEX	11.58752	3.0125	0.6754	4.63	0.0518	5.05	12.9125	2.8950	11.82	0.1679	15.45
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	1,2,3-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	1,2,4-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	1,3,5-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	11/15/1994	MW349-7	Naphthalene	0.29444	0.1456	0.0326	7.42	0.0901	8.61	0.0956	0.0214	5.49	0.0630	6.11

	Site Name	Fuel Type	Previous Sample Date	Sample Date	Locid	Analyte	Mass Fraction	Ghassemi *et al*., 1984 Linear C_o - C	Ghassemi Linear k	Ghassemi Linear %Red./yr	Ghassemi Exponential k	Ghassemi Exponential %Red./yr	Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987) Linear C_o - C	Mid-Range Linear k	Mid-Range Linear %Red./yr	Mid-Range Exponential k	Mid-Range Exponential %Red./yr
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	11/15/1994	6/26/1996	MW349-1	Benzene	1.16298	-0.0410	-0.0254	-2.27	-0.0223	-2.25	-0.0410	-0.0254	-2.27	-0.0223	-2.25
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	11/15/1994	6/26/1996	MW349-1	Toluene	5.02762	0.5415	0.3356	6.03	0.0634	6.14	0.5415	0.3356	6.03	0.0634	6.14
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	11/15/1994	6/26/1996	MW349-1	Ethylbenzene	1.57459	-0.1789	-0.1109	-7.94	-0.0747	-7.76	-0.1789	-0.1109	-7.94	-0.0747	-7.76
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	11/15/1994	6/26/1996	MW349-1	Total Xylenes (m,p, and o)	5.21547	0.4864	0.3014	5.29	0.0553	5.38	0.4864	0.3014	1.67	0.0553	5.38
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	11/15/1994	6/26/1996	MW349-1	Total BTEX	12.98066	0.8080	0.5007	3.63	0.0374	3.67	0.8080	0.5007	3.63	0.0374	3.67

	Site Name	Fuel Type	Spill Date	Sample Date	Locid	Analyte	Mass Fraction	Ghassemi *et al*., 1984 Linear C_o - C	Ghassemi Linear k	Ghassemi Linear %Red./yr	Ghassemi Exponential k	Ghassemi Exponential %Red./yr	Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987) Linear C_o - C	Mid-Range Linear k	Mid-Range Linear %Red./yr	Mid-Range Exponential k	Mid-Range Exponential %Red./yr
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	Benzene	0.12871	1.3713	0.2258	15.05	0.4043	33.26	2.5713	0.4233	15.68	0.5011	39.41
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	Toluene	1.65768	4.2423	0.6984	11.84	0.2090	18.86	10.8423	1.7850	14.28	0.3326	28.30
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	Ethylbenzene	1.36119	-0.0612	-0.0101	-0.77	-0.0076	-0.76	0.3388	0.0558	3.28	0.0366	3.59
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	Total Xylenes (m,p, and o)	4.39084	1.5092	0.2485	4.21	0.0486	4.75	3.2092	0.5283	2.94	0.0903	8.64
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	Total BTEX	7.53841	7.0616	1.1626	7.96	0.1088	10.31	16.9616	2.7925	11.40	0.1941	17.64
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	1,2,3-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	1,2,4-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	1,3,5-Trimethylbenzene											
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/26/1996	MW349-8	Naphthalene											

	Site Name	Fuel Type	Previous Sample Date	Sample Date	Locid	Analyte	Mass Fraction	Ghassemi *et al*., 1984 Linear C_o - C	Ghassemi Linear k	Ghassemi Linear %Red./yr	Ghassemi Exponential k	Ghassemi Exponential %Red./yr	Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987) Linear C_o - C	Mid-Range Linear k	Mid-Range Linear %Red./yr	Mid-Range Exponential k	Mid-Range Exponential %Red./yr
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	Benzene	1.15417	0.0088	0.0089	0.76	0.0077	0.76	0.0088	0.0089	0.76	0.0077	0.76
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	Toluene	5.55556	-0.5279	-0.5323	-10.59	-0.1007	-10.59	-0.5279	-0.5323	-10.59	-0.1007	-10.59
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	Ethylbenzene	1.54167	0.0329	0.0332	2.11	0.0213	2.11	0.0329	0.0332	2.11	0.0213	2.11
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	Total Xylenes (m,p, and o)	5.96389	-0.7484	-0.7546	-14.47	-0.1352	-14.48	-0.7484	-0.7546	-4.19	-0.1352	-14.48
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	Total BTEX	14.21528	-1.2346	-1.2448	-9.59	-0.0916	-9.59	-1.2346	-1.2448	-9.59	-0.0916	-9.59
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	1,2,3-Trimethylbenzene	0.47917	-0.4792	-0.4831	#DIV/0!	#DIV/0!	#DIV/0!	-0.4792	-0.4831	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	1,2,4-Trimethylbenzene	2.05556	-2.0556	-2.0726	#DIV/0!	#DIV/0!	#DIV/0!	-2.0556	-2.0726	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	1,3,5-Trimethylbenzene	0.60278	-0.6028	-0.6078	#DIV/0!	#DIV/0!	#DIV/0!	-0.6028	-0.6078	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	6/23/1997	MW-349-1FP	Naphthalene	0.30139	-0.3014	-0.3039	#DIV/0!	#DIV/0!	#DIV/0!	-0.3014	-0.3039	#DIV/0!	#DIV/0!	#DIV/0!

		Fuel	Spill	Sample				Ghassemi *et al*., 1984					Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987)				
								Linear			Exponential		Linear			Exponential	
	Site Name	**Type**	**Date**	**Date**	**Locid**	**Analyte**	**Mass Fraction**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	Benzene	1.30886	0.1911	0.0271	1.80	0.0193	1.91	1.3911	0.1969	7.29	0.1025	9.74
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	Toluene	5.62327	0.2767	0.0392	0.66	0.0068	0.68	6.8767	0.9732	7.79	0.1131	10.69
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	Ethylbenzene	1.84211	-0.5421	-0.0767	-5.90	-0.0493	-5.06	-0.1421	-0.0201	-1.18	-0.0114	-1.14
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	Total Xylenes (m,p, and o)	6.05402	-0.1540	-0.0218	-0.37	-0.0036	-0.37	1.5460	0.2188	1.22	0.0322	3.17
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	Total BTEX	14.82825	-0.2283	-0.0323	-0.22	-0.0022	-0.22	9.6717	1.3688	5.59	0.0711	6.86
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	1,2,3-Trimethylbenzene	0.53601	-0.5360	-0.0759	#DIV/0!	#DIV/0!	#DIV/0!	-0.5360	-0.0759	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	1,2,4-Trimethylbenzene	2.17452	-2.1745	-0.3078	#DIV/0!	#DIV/0!	#DIV/0!	-2.1745	-0.3078	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	1,3,5-Trimethylbenzene	0.63158	-0.6316	-0.0894	#DIV/0!	#DIV/0!	#DIV/0!	-0.6316	-0.0894	#DIV/0!	#DIV/0!	#DIV/0!
NRMRL	Tank 349, Offutt AFB, NE	Gasoline	6/1/1990	6/23/1997	MW-349-6FP	Naphthalene	0.28809	0.1519	0.0215	4.89	0.0599	5.82	0.1019	0.0144	3.70	0.0429	4.20

		Fuel	Previous Sample	Sample				Ghassemi *et al*., 1984					Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987)				
								Linear			Exponential		Linear			Exponential	
	Site Name	**Type**	**Date**	**Date**	**Locid**	**Analyte**	**Mass Fraction**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	Benzene	0.58000	0.5742	0.1256	10.89	0.1506	13.98	0.5742	0.1256	10.89	0.1506	13.98
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	Toluene	5.80000	-0.2444	-0.0535	-0.96	-0.0094	-0.95	-0.2444	-0.0535	-0.96	-0.0094	-0.95
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	Ethylbenzene	1.70000	-0.1583	-0.0346	-2.25	-0.0214	-2.16	-0.1583	-0.0346	-2.25	-0.0214	-2.16
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	Total Xylenes (m,p, and o)	8.30000	-2.3361	-0.5112	-8.57	-0.0723	-7.50	-2.3361	-0.5112	-2.84	-0.0723	-7.50
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	Total BTEX	16.38000	-2.1647	-0.4737	-3.33	-0.0310	-3.15	-2.1647	-0.4737	-3.33	-0.0310	-3.15
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	1,2,3-Trimethylbenzene	0.65000	-0.1708	-0.0374	-7.80	-0.0667	-6.90	-0.1708	-0.0374	-7.80	-0.0667	-6.90
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	1,2,4-Trimethylbenzene	2.80000	-0.7444	-0.1629	-7.93	-0.0676	-7.00	-0.7444	-0.1629	-7.93	-0.0676	-7.00
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	1,3,5-Trimethylbenzene	0.73000	-0.1272	-0.0278	-4.62	-0.0419	-4.28	-0.1272	-0.0278	-4.62	-0.0419	-4.28
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	1/16/2002	MW-349-1FP	Naphthalene	0.37000	-0.0686	-0.0150	-4.98	-0.0449	-4.59	-0.0686	-0.0150	-4.98	-0.0449	-4.59

		Fuel	Previous Sample	Sample				Ghassemi *et al*., 1984					Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987)				
								Linear			Exponential		Linear			Exponential	
	Site Name	**Type**	**Date**	**Date**	**Locid**	**Analyte**	**Mass Fraction**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	Benzene	0.60000	0.7089	0.1399	10.69	0.1539	14.26	0.7089	0.1399	10.69	0.1539	14.26
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	Toluene	4.90000	0.7233	0.1427	2.54	0.0272	2.68	0.7233	0.1427	2.54	0.0272	2.68
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	Ethylbenzene	1.80000	0.0421	0.0083	0.45	0.0046	0.46	0.0421	0.0083	0.45	0.0046	0.46
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	Total Xylenes (m,p, and o)	7.20000	-1.1460	-0.2261	-3.73	-0.0342	-3.48	-1.1460	-0.2261	-1.26	-0.0342	-3.48
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	Total BTEX	14.50000	0.3283	0.0648	0.44	0.0044	0.44	0.3283	0.0648	0.44	0.0044	0.44
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	1,2,3-Trimethylbenzene	0.58000	-0.0440	-0.0087	-1.62	-0.0156	-1.57	-0.0440	-0.0087	-1.62	-0.0156	-1.57
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	1,2,4-Trimethylbenzene	2.90000	-0.7255	-0.1431	-6.58	-0.0568	-5.84	-0.7255	-0.1431	-6.58	-0.0568	-5.84
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	1,3,5-Trimethylbenzene	0.61000	0.0216	0.0043	0.67	0.0069	0.68	0.0216	0.0043	0.67	0.0069	0.68
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/23/1997	7/17/2002	MW-349-6FP	Naphthalene	0.18000	0.1081	0.0213	7.40	0.0928	8.86	0.1081	0.0213	7.40	0.0928	8.86

		Fuel	Previous Sample	Sample				Ghassemi *et al*., 1984					Mid-Range (Potter, 1988), AD Little, Inc. (1987), & Sigsby *et al*. (1987)				
								Linear			Exponential		Linear			Exponential	
	Site Name	**Type**	**Date**	**Date**	**Locid**	**Analyte**	**Mass Fraction**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**	**C_o - C**	**k**	**%Red./yr**	**k**	**%Red./yr**
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	Benzene	0.16000	-0.0313	-0.0052	-4.01	-0.0359	-3.66	-0.0313	-0.0052	-4.01	-0.0359	-3.66
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	Toluene	2.50000	-0.8423	-0.1390	-8.38	-0.0678	-7.01	-0.8423	-0.1390	-8.38	-0.0678	-7.01
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	Ethylbenzene	1.70000	-0.3388	-0.0559	-4.11	-0.0367	-3.74	-0.3388	-0.0559	-4.11	-0.0367	-3.74
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	Total Xylenes (m,p, and o)	7.60000	-3.2092	-0.5295	-12.06	-0.0905	-9.48	-3.2092	-0.5295	-2.94	-0.0905	-9.48
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	Total BTEX	11.96000	-4.4216	-0.7296	-9.68	-0.0762	-7.91	-4.4216	-0.7296	-9.68	-0.0762	-7.91
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	1,2,3-Trimethylbenzene	0.77000	-0.7700	-0.1271	#DIV/0!	#DIV/0!	#DIV/0!	-0.7700	-0.1271	#DIV/0!	#DIV/0!	#DIV/0!
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	1,2,4-Trimethylbenzene	3.10000	-3.1000	-0.5115	#DIV/0!	#DIV/0!	#DIV/0!	-3.1000	-0.5115	#DIV/0!	#DIV/0!	#DIV/0!
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	1,3,5-Trimethylbenzene	0.87000	-0.8700	-0.1436	#DIV/0!	#DIV/0!	#DIV/0!	-0.8700	-0.1436	#DIV/0!	#DIV/0!	#DIV/0!
OBG	Tank 349, Offutt AFB, NE	Gasoline	6/26/1996	7/17/2002	MW349-8	Naphthalene	0.87000	-0.8700	-0.1436	#DIV/0!	#DIV/0!	#DIV/0!	-0.8700	-0.1436	#DIV/0!	#DIV/0!	#DIV/0!

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Offutt AFB, Tank 349
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
MW349-1	6/1/1990	0.00	1.5000	5.9000	1.3000					0.0000	14.6000
	11/15/1994	4.46	1.1220	5.5691	1.3957					5.7019	13.7886
	6/26/1996	6.07	1.1630	5.0276	1.5746					5.2155	12.9807
	6/23/1997	7.07	1.1542	5.5556	1.5417					5.9639	14.2153
	1/16/2002	11.64	0.5800	5.8000	1.7000					8.3000	16.3800

linear	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
Co	1.5393	5.6311	1.2937	#VALUE!	#VALUE!	#VALUE!	#VALUE!	1.0436	13.5225
Predicted C - latest sample date	0.6727	5.5105	1.7090	#VALUE!	#VALUE!	#VALUE!	#VALUE!	8.9889	15.2546
linear rate constant (k) (slope)	0.0745	0.0104	-0.0357	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-0.6828	-0.1489
average yearly reduction (%)	4.84	0.18	-2.76	#VALUE!	#VALUE!	#VALUE!	#VALUE!	-65.43	-1.10

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0745	1.5393	-0.0104	5.6311	0.0357	1.2937	0.6828	1.0436	0.1489	13.5225
0.0142	0.0989	0.0458	0.3190	0.0059	0.0413	0.1398	0.9730	0.1500	1.0441
0.9016	0.1198	0.0168	0.3867	0.9234	0.0501	0.8883	1.1795	0.2471	1.2657
27	3	0	3	36	3	24	3	1	3
0.3946	0.0431	0.0076	0.4485	0.0906	0.0075	33.1776	4.1740	1.5769	4.8057

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
Co	1.6552	5.6210	1.3002	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#NUM!	13.5633
exponential rate constant (k)	0.0769	0.0018	-0.0240	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#NUM!	-0.0096
% reduction/year	7.41	0.18	-2.43	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#NUM!	-0.97

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.9259	1.6552	0.9982	5.6210	1.0243	1.3002	#NUM!	#NUM!	1.0097	13.5633
0.0196	0.1363	0.0084	0.0587	0.0041	0.0283	#NUM!	#NUM!	0.0104	0.0721
0.8372	0.1653	0.0150	0.0712	0.9207	0.0343	#NUM!	#NUM!	0.2239	0.0874
15	3	0	3	35	3	#NUM!	#NUM!	1	3
0.4212	0.0819	0.0002	0.0152	0.0409	0.0035	#NUM!	#NUM!	0.0066	0.0229
	0.5039		1.7265		0.2625		#NUM!		2.6074

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Offutt AFB, Tank 349
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
MW349-6	6/1/1990	0.00	1.5000	5.9000	1.3000					5.9000	14.6000
	6/23/1997	7.07	1.3089	5.6233	1.8421					6.0540	14.8283
	7/17/2002	12.13	0.6000	4.9000	1.8000					4.9000	14.5000

linear

	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
Co	1.5919	5.9843	1.3693	#VALUE!	#VALUE!	#VALUE!	#VALUE!	6.1032	14.6791
Predicted C - latest sample date	0.7281	5.0176	1.8965	#VALUE!	#VALUE!	#VALUE!	#VALUE!	5.1833	14.6102
linear rate constant (k) (slope)	0.0712	0.0797	-0.0435	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0758	0.0057
average yearly reduction (%)	4.47	1.33	-3.17	#VALUE!	#VALUE!	#VALUE!	#VALUE!	1.24	0.04

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.0712	1.5919	-0.0797	5.9843	0.0435	1.3693	-0.0758	6.1032	-0.0057	14.6791
0.0314	0.2545	0.0288	0.2336	0.0237	0.1919	0.0694	0.5630	0.0270	0.2190
0.8371	0.2706	0.8843	0.2484	0.7712	0.2040	0.5438	0.5985	0.0422	0.2329
5	1	8	1	3	1	1	1	0	1
0.3764	0.0732	0.4715	0.0617	0.1403	0.0416	0.4270	0.3582	0.0024	0.0542

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
Co	1.6738	5.9987	1.3583	#VALUE!	#VALUE!	#VALUE!	#VALUE!	6.1221	14.6788
exponential rate constant (k)	0.0720	0.0148	-0.0282	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.0141	0.0004
% reduction/year	6.94	1.47	-2.86	#VALUE!	#VALUE!	#VALUE!	#VALUE!	1.40	0.04

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.9306	1.6738	0.9853	5.9987	1.0286	1.3583	0.9860	6.1221	0.9996	14.6788
0.0375	0.3037	0.0057	0.0460	0.0150	0.1216	0.0126	0.1024	0.0018	0.0149
0.7867	0.3229	0.8716	0.0489	0.7800	0.1293	0.5550	0.1088	0.0433	0.0159
4	1	7	1	4	1	1	1	0	1
0.3846	0.1043	0.0162	0.0024	0.0593	0.0167	0.0148	0.0118	0.0000	0.0003
	0.5151		1.7915		0.3063		1.8119		2.6864

ANALYSIS OF FREE PRODUCT WEATHERING RATES FOR JP-4 SITES WHERE 2 OR MORE SAMPLING EVENTS HAVE BEEN PERFORMED

Offutt AFB, Tank 349
OBG DATA

Sample Location	Date	Time (yrs)	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
MW349-8	6/1/1990	0.00	1.5000	5.9000	1.3000					5.9000	14.6000
	6/26/1996	6.07	0.1287	1.6577	1.3612					4.3908	7.5384
	7/17/2002	12.13	0.1600	2.5000	1.7000					7.6000	11.9600

linear	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
Co	1.3369	5.2756	1.2526	#VALUE!	#VALUE!	#VALUE!	#VALUE!	5.2103	13.0754
Predicted C - latest sample date	-0.0674	1.6296	1.6339	#VALUE!	#VALUE!	#VALUE!	#VALUE!	6.6385	9.8347
linear rate constant (k) (slope)	0.1157	0.3005	-0.0314	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-0.1177	0.2671
average yearly reduction (%)	8.66	5.70	-2.51	#VALUE!	#VALUE!	#VALUE!	#VALUE!	-2.26	2.04

linear
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
-0.1105	1.2668	-0.2804	5.0542	0.0330	1.2537	0.1400	5.1142	-0.2179	12.6888
0.0667	0.5223	0.2417	1.8939	0.0132	0.1037	0.2246	1.7595	0.5462	4.2794
0.7331	0.5720	0.5736	2.0742	0.8612	0.1135	0.2797	1.9270	0.1373	4.6868
3	1	1	1	6	1	0	1	0	1
0.8985	0.3272	5.7865	4.3024	0.0800	0.0129	1.4420	3.7135	3.4962	21.9658

exponential	Benzene	Toluene	Ethylbenzene	m-Xylene	o-Xylene	p-Xylene	m,p-xylenes	Total Xylen	Total BTEX
Co	1.0913	4.7711	1.2611	#VALUE!	#VALUE!	#VALUE!	#VALUE!	5.2212	12.5617
exponential rate constant (k)	0.1948	0.0777	-0.0211	#VALUE!	#VALUE!	#VALUE!	#VALUE!	-0.0169	0.0213
% reduction/year	17.70	7.47	-2.13	#VALUE!	#VALUE!	#VALUE!	#VALUE!	-1.70	2.11

exponential
summary stats

Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
0.8315	0.9616	0.9316	4.4610	1.0223	1.2623	1.0211	5.1263	0.9837	12.1117
0.1271	0.9956	0.0799	0.6260	0.0084	0.0658	0.0402	0.3147	0.0534	0.4184
0.6783	1.0904	0.4399	0.6856	0.8737	0.0721	0.2120	0.3447	0.0869	0.4582
2	1	1	1	7	1	0	1	0	1
2.5067	1.1889	0.3692	0.4701	0.0360	0.0052	0.0320	0.1188	0.0200	0.2099
	-0.0392		1.4954		0.2330		1.6344		2.4942

APPENDIX C-2

K_{fw} CALCULATIONS

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS		FP Results	Units
1	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Benzene	280	50000	ug/L		14000000	ug/L
2	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	10/27/98	OFMW349-6	Benzene	341	8800	ug/L		3000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW-349-1	Benzene	431	13000	ug/L		5600000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-6	Benzene	481	16000	ug/L		7700000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-8	Benzene	42	4500	ug/L		190000	ug/L
							Analyte avg kfw	383					
1	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Toluene	788	66000	ug/L		52000000	ug/L
2	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	10/27/98	OFMW349-6	Toluene	1,500	20000	ug/L		30000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW-349-1	Toluene	2,100	30000	ug/L		63000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-6	Toluene	1,571	35000	ug/L		55000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-8	Toluene	1,316	19000	ug/L		25000000	ug/L
							Analyte avg kfw	1,455					
1	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Ethylbenzene	1,200	10000	ug/L		12000000	ug/L
2	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	10/27/98	OFMW349-6	Ethylbenzene	6,667	1800	ug/L		12000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW-349-1	Ethylbenzene	10,476	2100	ug/L		22000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-6	Ethylbenzene	5,000	3400	ug/L		17000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-8	Ethylbenzene	4,412	3400	ug/L		15000000	ug/L
							Analyte avg kfw	5,551					
1	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Total Xylenes (m,p, and o)	1,267	45000	ug/L		57000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW-349-1	Total Xylenes (m,p, and o)	8,333	12000	ug/L		100000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-6	Total Xylenes (m,p, and o)	4,813	16000	ug/L		77000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-8	Total Xylenes (m,p, and o)	4,063	16000	ug/L		65000000	ug/L
							Analyte avg kfw	4,619					
1	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	10/27/98	OFMW349-6	o-Xylene	4,857	3500	ug/L		17000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW-349-1	o-Xylene	6,857	3500	ug/L		24000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-6	o-Xylene	4,043	4700	ug/L		19000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-8	o-Xylene	3,696	4600	ug/L		17000000	ug/L
							Analyte avg kfw	4,863					
1	EAL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	10/27/98	OFMW349-6	m,p-Xylene	6,727	5500	ug/L		37000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW-349-1	m,p-Xylene	9,048	8400	ug/L		76000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-6	m,p-Xylene	5,182	11000	ug/L		57000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-8	m,p-Xylene	4,364	11000	ug/L		48000000	ug/L
							Analyte avg kfw	6,330					
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW-349-1	naphthalene	10,000	2000	ug/L		20000000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-6	naphthalene	4,796	980	ug/L		4700000	ug/L
3	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	07/17/02	MW-349-8	naphthalene	5,745	940	ug/L		5400000	ug/L
							Analyte avg kfw	6,847					
2	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Benzene	217	6000	ug/L		1300000	ug/L
1	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Benzene	265	10000	ug/L		2650000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Benzene	409	2300	ug/L		940000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Benzene	265	3700	ug/L		980000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Benzene	192	5000	ug/L		960000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Benzene	230	4300	ug/L		990000	ug/L
							Analyte avg kfw	263					
2	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Toluene	789	3800	ug/L		3000000	ug/L
1	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Toluene	946	6070	ug/L		5740000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Toluene	1,133	3000	ug/L		3400000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Toluene	967	3000	ug/L		2900000	ug/L

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS		FP Results	Units
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Toluene	1,000	2900	ug/L		2900000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Toluene	721	4300	ug/L		3100000	ug/L
							Analyte avg kfw	926					
2	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Ethylbenzene	3,415	410	ug/L		1400000	ug/L
1	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Ethylbenzene	4,060	436	ug/L		1770000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Ethylbenzene	4,688	320	ug/L		1500000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Ethylbenzene	3,421	380	ug/L		1300000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Ethylbenzene	4,000	350	ug/L		1400000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Ethylbenzene	1,806	720	ug/L		1300000	ug/L
							Analyte avg kfw	3,565					
2	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	o-Xylene	2,583	1200	ug/L		3100000	ug/L
1	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	o-Xylene	2,837	1230	ug/L		3490000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	o-Xylene	1,000	1300	ug/L		1300000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	o-Xylene	769	1300	ug/L		1000000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	o-Xylene	1,000	1200	ug/L		1200000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	o-Xylene	542	2400	ug/L		1300000	ug/L
							Analyte avg kfw	1,455					
2	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	m,p-Xylene	3,105	1900	ug/L		5900000	ug/L
1	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	m,p-Xylene	3,436	2180	ug/L		7490000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	m,p-Xylene	4,053	1900	ug/L		7700000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	m,p-Xylene	3,571	2100	ug/L		7500000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	m,p-Xylene	3,444	1800	ug/L		6200000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	m,p-Xylene	1,667	3900	ug/L		6500000	ug/L
							Analyte avg kfw	3,213					
2	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Total Xylenes (m,p, and o)	2,903	3100	ug/L		9000000	ug/L
1	EAL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Total Xylenes (m,p, and o)	3,220	3410	ug/L		10980000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Total Xylenes (m,p, and o)	2,813	3200	ug/L		9000000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Total Xylenes (m,p, and o)	2,500	3400	ug/L		8500000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Total Xylenes (m,p, and o)	2,467	3000	ug/L		7400000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Total Xylenes (m,p, and o)	1,238	6300	ug/L		7800000	ug/L
							Analyte avg kfw	2,523					
1	EAL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW8I	Benzene	203	1040	ug/L		211000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	Benzene	908	980	ug/L		890000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	Benzene	821	390	ug/L		320000	ug/L
							Analyte avg kfw	644					
1	EAL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW8I	Toluene	1,508	5	ug/L		7540	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	Toluene	56,000	25	ug/L	U	1400000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	Toluene	187,500	8	ug/L	J	1500000	ug/L
							Analyte avg kfw	1,508					
1	EAL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW8I	Ethylbenzene	3,553	515	ug/L		1830000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	Ethylbenzene	3,818	550	ug/L		2100000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	Ethylbenzene	6,667	240	ug/L		1600000	ug/L
							Analyte avg kfw	4,679					
1	EAL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW8I	o-Xylene	13,909	11	ug/L		153000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	o-Xylene	2,680	25	ug/L	U	67000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	o-Xylene	16,333	6	ug/L	J	98000	ug/L
							Analyte avg kfw	10,974					

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS		FP Results	Units
1	EAL	Pipeline Leak Site, Myrtle Beach AFB, S(	JP-4	01/01/81	03/04/97	MBMW8I	m,p-Xylene	3,569	1740	ug/L		6210000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, S(	JP-4	01/01/81	07/25/01	MBMW8I	m,p-Xylene	3,125	480	ug/L		1500000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, S(	JP-4	01/01/81	07/25/01	MBMW24	m,p-Xylene	6,667	75	ug/L		500000	ug/L
							Analyte avg kfw	4,454					
1	EAL	Pipeline Leak Site, Myrtle Beach AFB, S(	JP-4	01/01/81	03/04/97	MBMW8I	Total Xylenes (m,p, and o)	3,663	1782	ug/L		6528000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, S(	JP-4	01/01/81	07/25/01	MBMW8I	Total Xylenes (m,p, and o)	3,333	480	ug/L		1600000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, S(	JP-4	01/01/81	07/25/01	MBMW24	Total Xylenes (m,p, and o)	7,531	81	ug/L		610000	ug/L
							Analyte avg kfw	4,842					
	OBG	Pipeline Leak Site, Myrtle Beach AFB, S(	JP-4	01/01/81	07/25/01	MBMW8I	naphthalene	1,366	410	ug/L		560000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, S(	JP-4	01/01/81	07/25/01	MBMW24	naphthalene	3,415	410	ug/L		1400000	ug/L
							Analyte avg kfw	2,390					
3	EAL	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	05/17/97	CH-EW6	Benzene	11	2.3	ug/L		25	ug/L
3	EAL	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	05/16/97	CH-MW-103	Benzene	5	5	ug/L		25	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-103	Benzene	6,500	100	ug/L	U	650000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-108	Benzene	7,600	25	ug/L	U	190000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-EW-6	Benzene	12,000	20	ug/L	U	240000	ug/L
							Analyte avg kfw						
3	EAL	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	05/17/97	CH-EW6	Toluene	1,350	1	ug/L		1350	ug/L
3	EAL	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	05/16/97	CH-MW-103	Toluene	1,020	200	ug/L		204000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-103	Toluene	828	2900	ug/L		2400000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-108	Toluene	7,600	25	ug/L	U	190000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-EW-6	Toluene	12,000	20	ug/L	U	240000	ug/L
							Analyte avg kfw	1,066					
3	EAL	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	05/17/97	CH-EW6	Ethylbenzene	4,805	19	ug/L		91300	ug/L
3	EAL	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	05/16/97	CH-MW-103	Ethylbenzene	3,692	260	ug/L		960000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-103	Ethylbenzene	3,729	590	ug/L		2200000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-108	Ethylbenzene	4,444	45	ug/L		200000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-EW-6	Ethylbenzene	3,846	130	ug/L		500000	ug/L
							Analyte avg kfw	4,103					
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-103	o-Xylenes	2,556	900	ug/L		2300000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-108	o-Xylenes	3,455	55	ug/L		190000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-EW-6	o-Xylenes	12,000	20	ug/L	U	240000	ug/L
							Analyte avg kfw	3,005					
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-103	m,p-Xylenes	3,615	2600	ug/L		9400000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-108	m,p-Xylenes	6,500	40	ug/L		260000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-EW-6	m,p-Xylenes	3,636	440	ug/L		1600000	ug/L
							Analyte avg kfw	4,584					
3	EAL	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	05/17/97	CH-EW6	Total Xylenes (m,p, and o)	24,706	85	ug/L		2100000	ug/L
3	EAL	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	05/16/97	CH-MW-103	Total Xylenes (m,p, and o)	3,600	1500	ug/L		5400000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-103	Total Xylenes (m,p, and o)	3,429	3500	ug/L		12000000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-108	Total Xylenes (m,p, and o)	2,737	95	ug/L		260000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-EW-6	Total Xylenes (m,p, and o)	3,636	440	ug/L		1600000	ug/L
							Analyte avg kfw	7,622					
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-103	naphthalene	10,741	270	ug/L		2900000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-MW-108	naphthalene	917	480	ug/L		440000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahar	JP-4	10/01/75	02/07/02	CH-EW-6	naphthalene	2,476	210	ug/L		520000	ug/L
							Analyte avg kfw	4,711					

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS		FP Results	Units
1	EAL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Benzene	385	5200	ug/L		2000000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Benzene	600	100	ug/L	U	60000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Benzene	122	6000	ug/L		730000	ug/L
							Analyte avg kfw	253					
1	EAL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Toluene	40,000	25	ug/L		1000000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Toluene	4,200	100	ug/L	U	420000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Toluene	12,391	46	ug/L	J	570000	ug/L
							Analyte avg kfw						
1	EAL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Ethylbenzene	5,500	1000	ug/L		5500000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Ethylbenzene	1,481	810	ug/L		1200000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Ethylbenzene	1,856	970	ug/L		1800000	ug/L
							Analyte avg kfw	2,946					
1	EAL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	o-Xylene	4,300	1000	ug/L		4300000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	o-Xylene	1,417	120	ug/L		170000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	o-Xylene	2,100	100	ug/L	U	210000	ug/L
							Analyte avg kfw	2,606					
1	EAL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	m,p-Xylene	4,783	4600	ug/L		22000000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	m,p-Xylene	1,231	1300	ug/L		1600000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	m,p-Xylene	1,257	3500	ug/L		4400000	ug/L
							Analyte avg kfw	2,424					
1	EAL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Total Xylenes (m,p, and o)	4,696	5600	ug/L		26300000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Total Xylenes (m,p, and o)	1,200	1500	ug/L		1800000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Total Xylenes (m,p, and o)	1,278	3600	ug/L		4600000	ug/L
							Analyte avg kfw	2,391					
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	naphthalene	1,897	290	ug/L		550000	ug/L
	OBG	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	naphthalene	1,352	540	ug/L		730000	ug/L
							Analyte avg kfw	1,624					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW4	Benzene	1,700	100	ug/L		170000	ug/L
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW13	Benzene	263	1600	ug/L		420000	ug/L
							Analyte avg kfw	981					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW4	Toluene	2,514	350	ug/L		880000	ug/L
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW13	Toluene	762	4200	ug/L		3200000	ug/L
							Analyte avg kfw	1,638					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW4	Ethylbenzene	2,785	790	ug/L		2200000	ug/L
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW13	Ethylbenzene	3,684	380	ug/L		1400000	ug/L
							Analyte avg kfw	3,235					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW4	o-Xylene	1,667	1800	ug/L		3000000	ug/L
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW13	o-Xylene	1,800	1500	ug/L		2700000	ug/L
							Analyte avg kfw	1,733					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW4	m,p-Xylene	2,116	4300	ug/L		9100000	ug/L
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW13	m,p-Xylene	2,258	3100	ug/L		7000000	ug/L
							Analyte avg kfw	2,187					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW4	Total Xylenes (m,p, and o)	1,967	6100	ug/L		12000000	ug/L

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS		FP Results	Units
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW13	Total Xylenes (m,p, and o)	2,156	4500	ug/L		9700000	ug/L
							Analyte avg kfw	2,061					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW4	naphthalene	1,732	410	ug/L		710000	ug/L
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-4		07/24/01	SJ-AGE-MW13	naphthalene	3,077	390	ug/L		1200000	ug/L
							Analyte avg kfw	2,404					
1	EAL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Benzene	253	93	ug/L		23500	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VW-1	Benzene	12,800	25	ug/L	U	320000	ug/L
							Analyte avg kfw	253					
1	EAL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Toluene	1,470	83	ug/L		122000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VW-1	Toluene	12,800	25	ug/L	U	320000	ug/L
							Analyte avg kfw	1,470					
1	EAL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Ethylbenzene	5,818	550	ug/L		3200000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VW-1	Ethylbenzene	10,000	32	ug/L		320000	ug/L
							Analyte avg kfw	5,818					
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VW-1	o-Xylene	4,384	73	ug/L		320000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VW-1	m,p-Xylene	5,308	130	ug/L		690000	ug/L
1	EAL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Total Xylenes (m,p, and o)	6,636	1100	ug/L		7300000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VW-1	Total Xylenes (m,p, and o)	3,450	200	ug/L		690000	ug/L
							Analyte avg kfw	5,043					
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VW-1	naphthalene	9,700	100	ug/L		970000	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Benzene	558	4	ug/L		2230	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Toluene	1,250	16	ug/L		20000	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Ethylbenzene	4,571	35	ug/L		160000	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	o-Xylene	2,538	130	ug/L		330000	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	m,p-Xylene	4,857	140	ug/L		680000	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Total Xylenes (m,p, and o)	3,741	270	ug/L		1010000	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	05/19/97	Fresh JP-5	Benzene	455	3.3	ug/L		1500	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	05/19/97	Fresh JP-5	Toluene	1,500	24	ug/L		36000	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	05/19/97	Fresh JP-5	Ethylbenzene	4,568	81	ug/L		370000	ug/L
1	EAL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	05/19/97	Fresh JP-5	Total Xylenes (m,p, and o)	4,815	540	ug/L		2600000	ug/L
3	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Benzene	208	720	ug/L		150000	ug/L
3	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW2SFP	Benzene	272	810	ug/L		220000	ug/L
4	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MW1S	Benzene	278	180	ug/L		50000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Benzene	233	2100	ug/L		490000	ug/L
							Analyte avg kfw	240					
3	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Toluene	1,010	990	ug/L		1000000	ug/L
3	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW2SFP	Toluene	1,000	1100	ug/L		1100000	ug/L
4	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MW1S	Toluene	797	790	ug/L		630000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Toluene	1,289	450	ug/L		580000	ug/L
							Analyte avg kfw	1,005					
3	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Ethylbenzene	2,724	290	ug/L		790000	ug/L
3	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW2SFP	Ethylbenzene	3,529	340	ug/L		1200000	ug/L
4	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MW1S	Ethylbenzene	3,548	310	ug/L		1100000	ug/L

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS		FP Results	Units
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Ethylbenzene	3,400	500	ug/L		1700000	ug/L
							Analyte avg kfw	3,127					
3	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Total Xylenes (m,p, and o)	2,889	1800	ug/L		5200000	ug/L
3	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW2SFP	Total Xylenes (m,p, and o)	3,286	2100	ug/L		6900000	ug/L
4	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MW1S	Total Xylenes (m,p, and o)	3,409	1320	ug/L		4500000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Total Xylenes (m,p, and o)	2,944	1800	ug/L		5300000	ug/L
							Analyte avg kfw	3,087					
4	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MW1S	m,p-Xylene	3,827	810	ug/L		3100000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	m,p-Xylene	2,941	1700	ug/L		5000000	ug/L
							Analyte avg kfw	3,384					
4	EAL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MW1S	o-Xylene	2,745	510	ug/L		1400000	ug/L

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
1	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	11/15/94	MW349-1	Benzene	244	34000	ug/L		8280000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-1	Benzene	263	32000	ug/L		8420000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	Benzene	237	35000	ug/L		8310000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	Benzene	630	9200	ug/L		5800000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Benzene	246	38440	ug/L		9450000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-8	Benzene	100	9560	ug/L		955000	ug/L
							Analyte avg kfw	287					
1	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	11/15/94	MW349-1	Toluene	1151	35700	ug/L		41100000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-1	Toluene	917	39700	ug/L		36400000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	Toluene	943	42400	ug/L		40000000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	Toluene	2071	28000	ug/L		58000000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Toluene	926	43860	ug/L		40600000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-8	Toluene	513	24000	ug/L		12300000	ug/L
							Analyte avg kfw	1087					
1	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	11/15/94	MW349-1	Ethylbenzene	2877	3580	ug/L		10300000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-1	Ethylbenzene	2714	4200	ug/L		11400000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	Ethylbenzene	2440	4550	ug/L		11100000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	Ethylbenzene	3617	4700	ug/L		17000000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Ethylbenzene	3333	3990	ug/L		13300000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-8	Ethylbenzene	2544	3970	ug/L		10100000	ug/L
							Analyte avg kfw	2921					
1	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	11/15/94	MW349-1	o-Xylene	2457	4640	ug/L		11400000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-1	o-Xylene	2383	4490	ug/L		10700000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	o-Xylene	1860	5700	ug/L		10600000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	o-Xylene	339	62000	ug/L		21000000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	o-Xylene	2366	4650	ug/L		11000000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-8	o-Xylene	2189	4180	ug/L		9150000	ug/L
							Analyte avg kfw	1932					
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	m-Xylene	2817	8270	ug/L		23300000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	m-Xylene	3466	6780	ug/L		23500000	ug/L
1	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	11/15/94	MW349-1	m-Xylene	3168	6850	ug/L		21700000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-1	m-Xylene	2573	6880	ug/L		17700000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-8	m-Xylene	2476	6220	ug/L		15400000	ug/L
							Analyte avg kfw	2900					
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	p-Xylene	2561	3530	ug/L		9040000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	p-Xylene	3209	2870	ug/L		9210000	ug/L
1	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	11/15/94	MW349-1	p-Xylene	3219	2790	ug/L		8980000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-1	p-Xylene	3184	2940	ug/L		9360000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-8	p-Xylene	3065	2620	ug/L		8030000	ug/L
							Analyte avg kfw	3047					
1	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	11/15/94	MW349-1	m&p-Xylene	3183	9640	ug/L		30680000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-1	m&p-Xylene	2756	9820	ug/L		27060000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	m&p-Xylene	2741	11800	ug/L		32340000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	m&p-Xylene	3647	17000	ug/L		62000000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	m&p-Xylene	3466	6780	ug/L		23500000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-8	m&p-Xylene	2476	6220	ug/L		15400000	ug/L
							Analyte avg kfw	3045					
1	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	11/15/94	MW349-1	Total-Xylenes	2947	14280	ug/L		42080000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-1	Total-Xylenes	2639	14310	ug/L		37760000	ug/L

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	Total-Xylenes	2454	17500	ug/L		42940000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	Total-Xylenes	1051	79000	ug/L		83000000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Total-Xylenes	3018	11430	ug/L		34500000	ug/L
2	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/26/96	MW349-8	Total-Xylenes	2361	10400	ug/L		24550000	ug/L
							Analyte avg kfw	2411					
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	1,2,3-Trimethylbenzene	4049	852	ug/L		3450000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	1,2,3-Trimethylbenzene	5000	1300	ug/L		6500000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	1,2,3-Trimethylbenzene	7648	506	ug/L		3870000	ug/L
							Analyte avg kfw	5566					
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	1,2,4-Trimethylbenzene	4582	3230	ug/L		14800000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	1,2,4-Trimethylbenzene	4444	6300	ug/L		28000000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	1,2,4-Trimethylbenzene	8533	1840	ug/L		15700000	ug/L
							Analyte avg kfw	5853					
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	1,3,5-Trimethylbenzene	5136	845	ug/L		4340000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	1,3,5-Trimethylbenzene	4867	1500	ug/L		7300000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	1,3,5-Trimethylbenzene	10340	441	ug/L		4560000	ug/L
							Analyte avg kfw	6781					
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	Naphthalene	3001	723	ug/L		2170000	ug/L
4	OBG	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	01/16/02	MW349-1	Naphthalene	3978	930	ug/L		3700000	ug/kg
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	Naphthalene	4633	449	ug/L		2080000	ug/L
							Analyte avg kfw	3871					
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	1-MethylNaphthalene	7483	147	ug/L		1100000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	1-MethylNaphthalene	6618	136	ug/L		900000	ug/L
							Analyte avg kfw	7050					
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-1FP	2-MethylNaphthalene	14430	158	ug/L		2280000	ug/L
3	NRMRL	Tank 349, Offutt AFB, NE	Gasoline	06/01/90	06/23/97	MW-349-6FP	2-MethylNaphthalene	12740	146	ug/L		1860000	ug/L
							Analyte avg kfw	13585					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Benzene	803	1557	ug/L		1250000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	Benzene	1158	1425	ug/L		1650000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Benzene	266	8473	ug/L		2250000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	Benzene	334	4126	ug/L		1380000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Benzene	477	1300	ug/L		620000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Benzene	407	2700	ug/L		1100000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Benzene	343	3500	ug/L		1200000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Benzene	385	2600	ug/L		1000000	ug/L
							Analyte avg kfw	522					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Toluene	1044	2712	ug/L		2830000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	Toluene	2810	1171	ug/L		3290000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Toluene	554	8820	ug/L		4890000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	Toluene	1499	1675	ug/L		2510000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Toluene	1273	2200	ug/L		2800000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Toluene	1706	1700	ug/L		2900000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Toluene	1238	2100	ug/L		2600000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Toluene	1647	1700	ug/L		2800000	ug/L
							Analyte avg kfw	1471					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Ethylbenzene	3042	341.9	ug/L		1040000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	Ethylbenzene	4123	259.5	ug/L		1070000	ug/L

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Ethylbenzene	1138	1177	ug/L		1340000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	Ethylbenzene	2877	325	ug/L		935000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Ethylbenzene	4286	280	ug/L		1200000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Ethylbenzene	6316	190	ug/L		1200000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Ethylbenzene	4444	270	ug/L		1200000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Ethylbenzene	5000	240	ug/L		1200000	ug/L
							Analyte avg kfw	3903					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	o-Xylene	2310	1052	ug/L		2430000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	o-Xylene	3098	790.9	ug/L		2450000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	o-Xylene	971	3039	ug/L		2950000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	o-Xylene	2526	946	ug/L		2390000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	o-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	o-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	o-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	o-Xylene	#DIV/0!		ug/L			ug/L
							Analyte avg kfw	2226					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	m-Xylene	2646	1300	ug/L		3440000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	m-Xylene	3589	966.8	ug/L		3470000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	m-Xylene	1041	3976	ug/L		4140000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	m-Xylene	3217	1007	ug/L		3240000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	m-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	m-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	m-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	m-Xylene	#DIV/0!		ug/L			ug/L
							Analyte avg kfw	2624					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	p-Xylene	3069	426.8	ug/L		1310000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	p-Xylene	4131	312.3	ug/L		1290000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	p-Xylene	1093	1318	ug/L		1440000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	p-Xylene	2924	407	ug/L		1190000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	p-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	p-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	p-Xylene	#DIV/0!		ug/L			ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	p-Xylene	#DIV/0!		ug/L			ug/L
							Analyte avg kfw	2804					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	m&p-Xylene	2751	1726.8	ug/L		4750000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	m&p-Xylene	3721	1279.1	ug/L		4760000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	m&p-Xylene	1054	5294	ug/L		5580000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	m&p-Xylene	3133	1414	ug/L		4430000	ug/L
							Analyte avg kfw	2665					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Total Xylenes	2584	2778.8	ug/L		7180000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	Total Xylenes	3483	2070	ug/L		7210000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Total Xylenes	1024	8333	ug/L		8530000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	Total Xylenes	2890	2360	ug/L		6820000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Total Xylenes	3871	3100	ug/L		12000000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Total Xylenes	6875	1600	ug/L		11000000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Total Xylenes	4545	2200	ug/L		10000000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Total Xylenes	5238	2100	ug/L		11000000	ug/L
							Analyte avg kfw	3814					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	1,2,3-Trimethylbenzene	5855	534.6	ug/L		3130000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	1,2,3-Trimethylbenzene	7159	399.5	ug/L		2860000	ug/L

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	1,2,3-Trimethylbenzene	1869	1600	ug/L		2990000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	1,2,3-Trimethylbenzene	7794	485	ug/L		3780000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	1,2,3-Trimethylbenzene	7077	650	ug/L		4600000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	1,2,3-Trimethylbenzene	11707	410	ug/L		4800000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	1,2,3-Trimethylbenzene	7778	540	ug/L		4200000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	1,2,3-Trimethylbenzene	9231	520	ug/L		4800000	ug/L
							Analyte avg kfw	7309					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	1,2,4-Trimethylbenzene	7135	1026	ug/L		7320000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	1,2,4-Trimethylbenzene	9188	728.1	ug/L		6690000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	1,2,4-Trimethylbenzene	1980	2924	ug/L		5790000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	1,2,4-Trimethylbenzene	7853	927	ug/L		7280000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	1,2,4-Trimethylbenzene	9167	1200	ug/L		11000000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	1,2,4-Trimethylbenzene	15584	770	ug/L		12000000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	1,2,4-Trimethylbenzene	10000	1000	ug/L		10000000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	1,2,4-Trimethylbenzene	12000	1000	ug/L		12000000	ug/L
							Analyte avg kfw	9113					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	1,3,5-Trimethylbenzene	7959	276.4	ug/L		2200000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	1,3,5-Trimethylbenzene	10245	196.2	ug/L		2010000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	1,3,5-Trimethylbenzene	3952	873	ug/L		3450000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	1,3,5-Trimethylbenzene	15808	260	ug/L		4110000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	1,3,5-Trimethylbenzene	10286	350	ug/L		3600000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	1,3,5-Trimethylbenzene	16818	220	ug/L		3700000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	1,3,5-Trimethylbenzene	12143	280	ug/L		3400000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	1,3,5-Trimethylbenzene	13333	300	ug/L		4000000	ug/L
							Analyte avg kfw	11318					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	Naphthalene	3337	395.6	ug/L		1320000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	Naphthalene	3861	318.6	ug/L		1230000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	Naphthalene	1173	955	ug/L		1120000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	Naphthalene	4528	318	ug/L		1440000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-1	Naphthalene	2552	290	ug/L		740000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-2	Naphthalene	2933	300	ug/L		880000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-3	Naphthalene	2500	360	ug/L		900000	ug/L
3	OBG	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	07/18/02	SHMW1610-22	Naphthalene	3542	240	ug/L		850000	ug/L
							Analyte avg kfw	3053					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	1-MethylNaphthalene	8788	150.2	ug/L		1320000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	1-MethylNaphthalene	8646	138.8	ug/L		1200000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	1-MethylNaphthalene	1514	687	ug/L		1040000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	1-MethylNaphthalene	7789	190	ug/L		1480000	ug/L
							Analyte avg kfw	6684					
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-2	2-MethylNaphthalene	10333	212.9	ug/L		2200000	ug/L
2	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/11/98	SH98-1610-3	2-MethylNaphthalene	10107	195.9	ug/L		1980000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-2	2-MethylNaphthalene	2814	597	ug/L		1680000	ug/L
1	NRMRL	Bldg 1610, Shaw AFB, SC	JP-4	06/01/94	03/06/97	SHMW1610-3	2-MethylNaphthalene	14821	168	ug/L		2490000	ug/L
							Analyte avg kfw	9519					
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	Benzene	2600	100	ug/L		260000	ug/kg
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	Benzene	169	332	ug/L		56200	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	Benzene	300	400	ug/L		120000	ug/kg
							Analyte avg kfw	1023					
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	Toluene	13636	1.1	ug/L		15000	ug/kg

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	Toluene	2228	2.5	ug/L		5570	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	Toluene	3000	5	ug/L		15000	ug/kg
							Analyte avg kfw	6288					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	Ethylbenzene	7762	77.3	ug/L		600000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	Ethylbenzene	13571	56	ug/L		760000	ug/kg
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	Ethylbenzene	15455	110	ug/L		1700000	ug/kg
							Analyte avg kfw	12263					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	o-Xylene	3838	3.7	ug/L		14200	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	o-Xylene	21	10	ug/L	U	210	ug/kg
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	o-Xylene	2100	10	ug/L	U	21000	ug/kg
							Analyte avg kfw	2969					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	m-Xylene	36345	49.8	ug/L		1810000	ug/L
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	p-Xylene	76341	4.1	ug/L		313000	ug/L
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	m&p-Xylene	39388	53.9	ug/L		2123000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	m&p-Xylene	20667	15	ug/L		310000	ug/kg
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	m&p-Xylene	17978	89	ug/L		1600000	ug/kg
							Analyte avg kfw	26011					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	Total Xylenes	27541	77.6	ug/L		2137200	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	Total Xylenes	20667	15	ug/L		310000	ug/kg
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	Total Xylenes	17978	89	ug/L		1600000	ug/kg
							Analyte avg kfw	22062					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	1,2,3-Trimethylbenzene	33074	90.1	ug/L		2980000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	1,2,3-Trimethylbenzene	37662	77	ug/L		2900000	ug/kg
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	1,2,3-Trimethylbenzene	39344	61	ug/L		2400000	ug/kg
							Analyte avg kfw	36694					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	1,2,4-Trimethylbenzene	31100	209	ug/L		6500000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	1,2,4-Trimethylbenzene	40000	300	ug/L		12000000	ug/kg
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	1,2,4-Trimethylbenzene	52222	180	ug/L		9400000	ug/kg
							Analyte avg kfw	41108					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	1,3,5-Trimethylbenzene	84024	33.8	ug/L		2840000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	1,3,5-Trimethylbenzene	76923	13	ug/L		1000000	ug/kg
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	1,3,5-Trimethylbenzene	72414	29	ug/L		2100000	ug/kg
							Analyte avg kfw	77787					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	Naphthalene	7194	124	ug/L		892000	ug/L
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW24	Naphthalene	15730	89	ug/L		1400000	ug/kg
	OBG	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	07/25/01	MBMW8I	Naphthalene	15152	99	ug/L		1500000	ug/kg
							Analyte avg kfw	12692					
1	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	1-MethylNaphthalene	5116	258	ug/L		1320000	ug/L
	NRMRL	Pipeline Leak Site, Myrtle Beach AFB, SC	JP-4	01/01/81	03/04/97	MBMW24	2-MethylNaphthalene	9141	198	ug/L		1810000	ug/L
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	Benzene	1	36.9	ug/L		25	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	Benzene	1786	14	ug/L	J	25000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	Benzene	5105	1.9	ug/L	J	9700	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	Benzene	236	22	ug/L		5200	ug/kg
							Analyte avg kfw	1782					

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	Toluene	231	884	ug/L		204000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	Toluene	3947	760	ug/L	J	3000000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	Toluene	2500	5.6	ug/L	J	14000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	Toluene	2786	2.8	ug/L	J	7800	ug/kg
							Analyte avg kfw	2366					
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	Ethylbenzene	1600	535	ug/L		856000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	Ethylbenzene	11667	180	ug/L	J	2100000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	Ethylbenzene	3953	43	ug/L		170000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	Ethylbenzene	4455	110	ug/L		490000	ug/kg
							Analyte avg kfw	5419					
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	o-Xylene	2703	370	ug/L		1000000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	o-Xylene	10000	280	ug/L	J	2800000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	o-Xylene	5660	53	ug/L		300000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	o-Xylene	1486	7.4	ug/L		11000	ug/kg
							Analyte avg kfw	4962					
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	m-Xylene	2553	952	ug/L		2430000	ug/L
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	p-Xylene	1944	498	ug/L		968000	ug/L
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	m&p-Xylene	2343	1450	ug/L		3398000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	m&p-Xylene	14848	660	ug/L	J	9800000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	m&p-Xylene	4000	40	ug/L		160000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	m&p-Xylene	6800	250	ug/L		1700000	ug/kg
							Analyte avg kfw	6998					
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	Total Xylenes	2036	2160.4	ug/L		4398000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	Total Xylenes	13404	940	ug/L	J	12600000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	Total Xylenes	6080	7932	ug/L		48229000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	Total Xylenes	6647	257.4	ug/L		1711000	ug/kg
							Analyte avg kfw	12692					
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	1,2,3-Trimethylbenzene	7112	134	ug/L		953000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	1,2,3-Trimethylbenzene	18966	58	ug/L	J	1100000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	1,2,3-Trimethylbenzene	9150	153	ug/L		1400000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	1,2,3-Trimethylbenzene	34706	17	ug/L		590000	ug/kg
							Analyte avg kfw	17483					
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	1,2,4-Trimethylbenzene	7466	292	ug/L		2180000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	1,2,4-Trimethylbenzene	30000	100	ug/L	J	3000000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	1,2,4-Trimethylbenzene	12000	250	ug/L		3000000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	1,2,4-Trimethylbenzene	34615	52	ug/L		1800000	ug/kg
							Analyte avg kfw	21020					
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	1,3,5-Trimethylbenzene	12530	83	ug/L		1040000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	1,3,5-Trimethylbenzene	36667	30	ug/L	J	1100000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	1,3,5-Trimethylbenzene	14651	43	ug/L		630000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	1,3,5-Trimethylbenzene	60000	16	ug/L		960000	ug/kg
							Analyte avg kfw	30962					
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	Naphthalene	3325	151	ug/L		502000	ug/L
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-103	Naphthalene	11000	100	ug/L	J	1100000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-MW-108	Naphthalene	5357	280	ug/L		1500000	ug/kg
	OBG	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	02/07/02	CH-EW6	Naphthalene	18462	65	ug/L		1200000	ug/kg
							Analyte avg kfw	9536					

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	1-MethylNaphthalene	10219	137	ug/L		1400000	ug/L
3	NRMRL	DFSP-Charleston, Tank 1 Area, Hanahan, SC	JP-4	10/01/75	05/16/97	CH-MW-103	2-MethylNaphthalene	17822	101	ug/L		1800000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	Benzene	48	56.7	ug/L		2700	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Benzene	4286	2.8	ug/L	J	12000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Benzene	104	8680	ug/L		900000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Benzene	110	20000	ug/L		2200000	ug/kg
							Analyte avg kfw	1137					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	Toluene	11	2.3	ug/L		25	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Toluene	1417	12	ug/L	<	17000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Toluene	9	2.7	ug/L		25	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Toluene	320	25	ug/L	<	8000	ug/kg
							Analyte avg kfw	439					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	Ethylbenzene	4429	560	ug/L		2480000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Ethylbenzene	3968	630	ug/L		2500000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Ethylbenzene	4205	704	ug/L		2960000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Ethylbenzene	1128	3900	ug/L		4400000	ug/kg
							Analyte avg kfw	3432					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	o-Xylene	2884	586	ug/L		1690000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	o-Xylene	9815	54	ug/L		530000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	o-Xylene	9486	253	ug/L		2400000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	o-Xylene	700	800	ug/L		560000	ug/kg
							Analyte avg kfw	5721					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	m-Xylene	2663	199	ug/L		530000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	m-Xylene	5405	1643	ug/L		8880000	ug/L
							Analyte avg kfw	4034					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	p-Xylene	4138	708	ug/L		2930000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	p-Xylene	5080	811	ug/L		4120000	ug/L
							Analyte avg kfw	4609					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	m&p-Xylene	3815	907	ug/L		3460000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	m&p-Xylene	4364	1100	ug/L		4800000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	m&p-Xylene	5297	2454	ug/L		13000000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	m&p-Xylene	1167	18000	ug/L		21000000	ug/kg
							Analyte avg kfw	3661					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	Total Xylenes	3449	1493	ug/L		5150000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Total Xylenes	4619	1154	ug/L		5330000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Total Xylenes	5689	2707	ug/L		15400000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Total Xylenes	1147	18800	ug/L		21560000	ug/kg
							Analyte avg kfw	3726					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	1,2,3-Trimethylbenzene	10156	192	ug/L		1950000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	1,2,3-Trimethylbenzene	10833	240	ug/L		2600000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	1,2,3-Trimethylbenzene	12932	266	ug/L		3440000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	1,2,3-Trimethylbenzene	1143	3500	ug/L		4000000	ug/kg
							Analyte avg kfw	8766					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	1,2,4-Trimethylbenzene	13257	571	ug/L		7570000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	1,2,4-Trimethylbenzene	13253	830	ug/L		11000000	ug/kg

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	1,2,4-Trimethylbenzene	15303	628	ug/L		9610000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	1,2,4-Trimethylbenzene	1494	8700	ug/L		13000000	ug/kg
							Analyte avg kfw	10827					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	1,3,5-Trimethylbenzene	12605	334	ug/L		4210000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	1,3,5-Trimethylbenzene	14359	390	ug/L		5600000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	1,3,5-Trimethylbenzene	15860	314	ug/L		4980000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	1,3,5-Trimethylbenzene	1722	3600	ug/L		6200000	ug/kg
							Analyte avg kfw	11136					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	Naphthalene	6522	161	ug/L		1050000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW306	Naphthalene	6800	250	ug/L		1700000	ug/kg
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	Naphthalene	7634	131	ug/L		1000000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	10/10/01	EAKMW316	Naphthalene	625	2400	ug/L		1500000	ug/kg
							Analyte avg kfw	5395					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	1-MethylNaphthalene	18860	114	ug/L		2150000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	1-MethylNaphthalene	23781	67.7	ug/L		1610000	ug/L
							Analyte avg kfw	21321					
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW306-FP	2-MethylNaphthalene	21823	181	ug/L		3950000	ug/L
1	NRMRL	Spill Site No. 2, Eaker AFB, AR	JP-4	10/01/73	08/27/97	EAKMW316-FP	2-MethylNaphthalene	30177	96.1	ug/L		2900000	ug/L
							Analyte avg kfw	26000					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Benzene	637	3.5	ug/L		2230	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Benzene	45	49.1	ug/L		2230	ug/L
							Analyte avg kfw	341					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Toluene	118	110	ug/L		13000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Toluene	573	22.7	ug/L		13000	ug/L
							Analyte avg kfw	345					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Ethylbenzene	959	121	ug/L		116000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Ethylbenzene	563	206	ug/L		116000	ug/L
							Analyte avg kfw	761					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	o-Xylene	1631	176	ug/L		287000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	o-Xylene	935	307	ug/L		287000	ug/L
							Analyte avg kfw	1283					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	m-Xylene	1103	203	ug/L		224000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	m-Xylene	747	300	ug/L		224000	ug/L
							Analyte avg kfw	925					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	p-Xylene	1443	69	ug/L		99600	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	p-Xylene	1048	95	ug/L		99600	ug/L
							Analyte avg kfw	1246					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Total-Xylenes	1363	448	ug/L		610600	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Total-Xylenes	870	702	ug/L		610600	ug/L
							Analyte avg kfw	1116					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	m,p-Xylenes	1190	272	ug/L		323600	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	m,p-Xylenes	819	395	ug/L		323600	ug/L
							Analyte avg kfw	1004					

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	1,2,3-Trimethylbenzene	3380	503	ug/L		1700000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	1,2,3-Trimethylbenzene	3696	460	ug/L		1700000	ug/L
							Analyte avg kfw	3538					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	1,2,4-Trimethylbenzene	3265	631	ug/L		2060000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	1,2,4-Trimethylbenzene	3451	597	ug/L		2060000	ug/L
							Analyte avg kfw	3358					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	1,3,5-Trimethylbenzene	6794	126	ug/L		856000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	1,3,5-Trimethylbenzene	7575	113	ug/L		856000	ug/L
							Analyte avg kfw	7184					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Naphthalene	1655	275	ug/L		455000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	Naphthalene	1472	309	ug/L		455000	ug/L
							Analyte avg kfw	1564					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	1-MethylNaphthalene	6000	215	ug/L		1290000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	1-MethylNaphthalene	5513	234	ug/L		1290000	ug/L
							Analyte avg kfw	5756					
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	2-MethylNaphthalene	8721	172	ug/L		1500000	ug/L
1	NRMRL	Tank Farm C, Beaufort MCAS, SC	JP-5	06/01/90	08/12/97	BFT-401-3	2-MethylNaphthalene	7937	189	ug/L		1500000	ug/L
							Analyte avg kfw	8329					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Benzene	261	90	ug/L		23500	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	Benzene	12500	2	ug/L		25000	ug/kg
							Analyte avg kfw	6381					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Toluene	152	805	ug/L		122000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	Toluene	5362	6.9	ug/L		37000	ug/kg
							Analyte avg kfw	2757					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Ethylbenzene	2669	944	ug/L		2520000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	Ethylbenzene	6316	19	ug/L		120000	ug/kg
							Analyte avg kfw	4493					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	o-Xylene	635	499	ug/L		317000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	o-Xylene	8462	65	ug/L		550000	ug/kg
							Analyte avg kfw	4548					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	m-Xylene	1867	1500	ug/L		2800000	ug/L
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	p-Xylene	2221	752	ug/L		1670000	ug/L
							Analyte avg kfw	2044					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	m&p-Xylene	1985	2252	ug/L		4470000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	m&p-Xylene	6250	72	ug/L		450000	ug/kg
							Analyte avg kfw	4117					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Total xylenes	1740	2751	ug/L		4787000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	Total xylenes	7299	137	ug/L		1000000	ug/kg
							Analyte avg kfw	4520					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	1,2,3-TMB	6549	284	ug/L		1860000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	1,2,3-TMB	8333	216	ug/L		1800000	ug/kg
							Analyte avg kfw	7441					

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	1,2,4-TMB	6897	580	ug/L		4000000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	1,2,4-TMB	17045	88	ug/L		1500000	ug/kg
							Analyte avg kfw	11971					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	1,3,5-TMB	7735	181	ug/L		1400000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	1,3,5-TMB	11765	85	ug/L		1000000	ug/kg
							Analyte avg kfw	9750					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	Naphthalene	6787	277	ug/L		1880000	ug/L
	OBG	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	02/08/02	CEF-VEW-1	Naphthalene	8605	86	ug/L		740000	ug/kg
							Analyte avg kfw	7696					
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	1-Methylnaphthalene	12722	180	ug/L		2290000	ug/L
	NRMRL	Facility 293, Cecil Field NAS, FL	JP-5	06/01/81	05/20/97	CEF-293-9FP	2-Methylnaphthalene	21419	155	ug/L		3320000	ug/L
							Analyte avg kfw	17071					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Benzene	229	848	ug/L		194000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	Benzene	59	833	ug/L		48900	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Benzene	1412	340	ug/L		480000	ug/kg
							Analyte avg kfw	566					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Toluene	251	4100	ug/L		1030000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	Toluene	220	2896	ug/L		638000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Toluene	560	840	ug/L		470000	ug/kg
							Analyte avg kfw	344					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Ethylbenzene	1390	842	ug/L		1170000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	Ethylbenzene	1448	587	ug/L		850000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Ethylbenzene	6818	220	ug/L		1500000	ug/kg
							Analyte avg kfw	3219					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	o-Xylene	1860	946	ug/L		1760000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	o-Xylene	1459	760.8	ug/L		1110000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	o-Xylene	1500	200	ug/L		300000	ug/kg
							Analyte avg kfw	1606					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	m-Xylene	1891	1650	ug/L		3120000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	m-Xylene	1165	1296	ug/L		1510000	ug/L
							Analyte avg kfw	1528					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	p-Xylene	1729	642	ug/L		1110000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	p-Xylene	1361	435	ug/L		592000	ug/L
							Analyte avg kfw	1545					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJ98-MP2	m&p-Xylene	1846	2292	ug/L		4230000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	m&p-Xylene	1214	1731	ug/L		2102000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	m&p-Xylene	9643	560	ug/L		5400000	ug/kg
							Analyte avg kfw	4234					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Total xylenes	1850	3238	ug/L		5990000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	Total xylenes	1289	2491.8	ug/L		3212000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Total xylenes	7500	760	ug/L		5700000	ug/kg
							Analyte avg kfw	3546					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	1,2,3-Trimethylbenzene	6340	429	ug/L		2720000	ug/L

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	1,2,3-Trimethylbenzene	6076	383.5	ug/L		2330000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	1,2,3-Trimethylbenzene	22619	84	ug/L		1900000	ug/kg
							Analyte avg kfw	11678					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	1,2,4-Trimethylbenzene	7269	769	ug/L		5590000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	1,2,4-Trimethylbenzene	6281	697.3	ug/L		4380000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	1,2,4-Trimethylbenzene	37143	210	ug/L		7800000	ug/kg
							Analyte avg kfw	16898					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	1,3,5-Trimethylbenzene	8108	259	ug/L		2100000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	1,3,5-Trimethylbenzene	6284	183	ug/L		1150000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	1,3,5-Trimethylbenzene	41509	53	ug/L		2200000	ug/kg
							Analyte avg kfw	18634					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	Naphthalene	5039	254	ug/L		1280000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	Naphthalene	3557	247.1	ug/L		879000	ug/L
	OBG	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	07/24/01	SJMW (18' from 1)	Naphthalene	12000	100	ug/L		1200000	ug/kg
							Analyte avg kfw	6866					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	1-MethylNaphthalene	9497	159	ug/L		1510000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	1-MethylNaphthalene	11759	109.7	ug/L		1290000	ug/L
							Analyte avg kfw	10628					
3	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	05/15/97	SJMW1SFP	2-MethylNaphthalene	16963	135	ug/L		2290000	ug/L
4	NRMRL	Bldg 4522, Seymour Johnson AFB, SC	JP-8	12/01/95	03/10/98	SJ98-MP2	2-MethylNaphthalene	13361	142.2	ug/L		1900000	ug/L
							Analyte avg kfw	15162					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	Benzene	14	740	ug/L		10000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	Benzene	293	1500	ug/L		440000	ug/kg
							Analyte avg kfw	153					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	Toluene	257	1400	ug/L		360000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	Toluene	1263	3800	ug/L		4800000	ug/kg
							Analyte avg kfw	760					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	Ethylbenzene	2875	800	ug/L		2300000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	Ethylbenzene	3407	270	ug/L		920000	ug/kg
							Analyte avg kfw	3141					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	o-Xylene	2526	1900	ug/L		4800000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	o-Xylene	3083	1200	ug/L		3700000	ug/kg
							Analyte avg kfw	2805					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	m&p-Xylene	3421	3800	ug/L		13000000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	m&p-Xylene	3905	2100	ug/L		8200000	ug/kg
							Analyte avg kfw	3663					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	Total xylenes	3158	5700	ug/L		18000000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	Total xylenes	3636	3300	ug/L		12000000	ug/kg
							Analyte avg kfw	3397					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	1,2,3-Trimethylbenzene	7838	370	ug/L		2900000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	1,2,3-Trimethylbenzene	4130	460	ug/L		1900000	ug/kg
							Analyte avg kfw	5984					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	1,2,4-Trimethylbenzene	14141	990	ug/L		14000000	ug/kg

Event	Lab Code	Site Name	Fuel Type	Spill Date	Date	FPLocid	Analyte	Kfw	GW Results	GW UNITS	Flag	FP Results	Units
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	1,2,4-Trimethylbenzene	12353	510	ug/L		6300000	ug/kg
							Analyte avg kfw	13247					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	1,3,5-Trimethylbenzene	17917	240	ug/L		4300000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	1,3,5-Trimethylbenzene	14706	170	ug/L		2500000	ug/kg
							Analyte avg kfw	16311					
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW4	Naphthalene	4875	160	ug/L		780000	ug/kg
	OBG	AGE Area, Seymour Johnson AFB, SC	JP-5	12/01/95	07/24/01	SJ-AGE-MW13	Naphthalene	5417	240	ug/L		1300000	ug/kg
							Analyte avg kfw	5146					
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	Benzene	50	0.5	ug/L		25	ug/L
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	Benzene	50	0.5	ug/L		25	ug/L
							Analyte avg kfw	50					
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	Toluene	1	20	ug/L		25	ug/L
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	Toluene	25	1	ug/L		25	ug/L
							Analyte avg kfw	13					
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	Ethylbenzene	9000	7	ug/L		63000	ug/L
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	Ethylbenzene	1969	32	ug/L		63000	ug/L
							Analyte avg kfw	5484					
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	o-Xylene	13727	33	ug/L		453000	ug/L
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	o-Xylene	4768	95	ug/L		453000	ug/L
							Analyte avg kfw	9248					
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	m,p-Xylene	2521	219	ug/L		552000	ug/L
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	m,p-Xylene	NA	0	ug/L		552000	ug/L
							Analyte avg kfw	2521					
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	Total Xylenes (m,p, and o)	3988	252	ug/L		1005000	ug/L
1	NRMRL	JP-8 Release Site, Pope AFB, NC	JP-8	04/01/96	07/17/96	SOURCE AREA	Total Xylenes (m,p, and o)	10579	95	ug/L		1005000	ug/L
							Analyte avg kfw	7284					

APPENDIX C-3

RESIDUAL LNAPL CALCULATIONS

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	Benzene	42.8	mg/kg		B/FC	0.021725888	MW349-1	738000	ug/mL	16034
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	Toluene	105	mg/kg		T/FC	0.053299492	MW349-1	738000	ug/mL	39335
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	Ethylbenzene	24.4	mg/kg		E/FC	0.012385787	MW349-1	738000	ug/mL	9141
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	m-Xylene	42.4	mg/kg		m-Xylene/FC	0.021522843	MW349-1	738000	ug/mL	15884
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	o-Xylene	24.3	mg/kg		o-Xylene/FC	0.012335025	MW349-1	738000	ug/mL	9103
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	p-Xylene	19.3	mg/kg		p-Xylene/FC	0.009796954	MW349-1	738000	ug/mL	7230
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	Total Xylenes (m,p, and o)	86	mg/kg		X/FC	0.043654822	MW349-1	738000	ug/mL	32217
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	Total BTEX	258.2	mg/kg		BTEX/FC	0.13106599	MW349-1	738000	ug/mL	96727
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	B+T	147.8	mg/kg		(B+T)/FC	0.075025381	MW349-1	738000	ug/mL	55369
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	E+X	110.4	mg/kg		(E+X)/FC	0.056040609	MW349-1	738000	ug/mL	41358
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	B/T	0.40761905			(B/T)/FC	0.000206913	MW349-1	738000	ug/mL	153
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	B/E	1.75409836			(B/E)/FC	0.000890405	MW349-1	738000	ug/mL	657
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	B/X	0.49767442			(B/X)/FC	0.000252627	MW349-1	738000	ug/mL	186
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	T/E	4.30327869			(T/E)/FC	0.002184405	MW349-1	738000	ug/mL	1612
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	T/X	1.22093023			(T/X)/FC	0.000619762	MW349-1	738000	ug/mL	457
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	E/X	0.28372093			(E/X)/FC	0.000144021	MW349-1	738000	ug/mL	106
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	(B+T)/(E+X)	1.33876812			((B+T)/(E+X))/FC	0.000679578	MW349-1	738000	ug/mL	502
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	CPT1-39.5	Fuel Carbon	1970	mg/kg	TP	Fuel Carbon	1	MW349-1	738000	ug/mL	738000
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	Benzene	0.562	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	Toluene	0.334	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	Ethylbenzene	0.291	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	m-Xylene	0.42	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	o-Xylene	0.147	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	p-Xylene	0.224	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	Total Xylenes (m,p, and o)	0.791	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	Total BTEX	1.978	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	B+T	0.896	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	E+X	1.082	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	B/T	1.68263473								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	B/E	1.93127148								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	B/X	0.71049305								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	T/E	1.14776632								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	T/X	0.42225032								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	E/X	0.36788875								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	(B+T)/(E+X)	0.82809612								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	1,2,3-Trimethylbenzene	0.044	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	1,2,4-Trimethylbenzene	0.295	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	1,3,5-Trimethylbenzene	0.106	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	1-MethylNaphthalene	0.0118	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-39'	2-MethylNaphthalene	0.0315	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	Benzene	40.2	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	Toluene	165	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	Ethylbenzene	58.7	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	m-Xylene	99.8	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	o-Xylene	55.2	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	p-Xylene	48	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	Total Xylenes (m,p, and o)	203	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	Total BTEX	466.9	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	B+T	205.2	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	E+X	261.7	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	B/T	0.24363636								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	B/E	0.68483816								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	B/X	0.19802956								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	T/E	2.8109029								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	T/X	0.81280788								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	E/X	0.28916256								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	(B+T)/(E+X)	0.78410394								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	1,2,3-Trimethylbenzene	17.6	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	1,2,4-Trimethylbenzene	66	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	1,3,5-Trimethylbenzene	22.3	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	1-MethylNaphthalene	5.59	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-1-40'	2-MethylNaphthalene	11.7	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	Benzene	19.2	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	Toluene	83.2	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	Ethylbenzene	37	mg/kg							

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	m-Xylene	58.7	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	o-Xylene	32.9	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	p-Xylene	28.1	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	Total Xylenes (m,p, and o)	119.7	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	Total BTEX	259.1	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	B+T	102.4	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	E+X	156.7	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	B/T	0.23076923								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	B/E	0.51891892								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	B/X	0.160401								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	T/E	2.24864865								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	T/X	0.69507101								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	E/X	0.3091061								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	(B+T)/(E+X)	0.65347798								
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	1,2,3-Trimethylbenzene	11.7	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	1,2,4-Trimethylbenzene	45.6	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	1,3,5-Trimethylbenzene	14	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	1-MethylNaphthalene	2.63	mg/kg							
NRMRL	Gasoline	6/1/1990	######	Tank 349, Offutt AFB, NE	Soil	OFSB-2-39'	2-MethylNaphthalene	5.36	mg/kg							

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	Benzene	0.331	mg/kg		B/FC	0.000129	SH98-1610-2	780000	ug/mL	101
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	Toluene	0.551	mg/kg		T/FC	0.000215	SH98-1610-2	780000	ug/mL	168
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	Ethylbenzene	1.84	mg/kg		E/FC	0.000719	SH98-1610-2	780000	ug/mL	561
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	m-Xylene	5.11	mg/kg		m-Xylene/FC	0.001996	SH98-1610-2	780000	ug/mL	1557
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	o-Xylene	1.86	mg/kg		o-Xylene/FC	0.000727	SH98-1610-2	780000	ug/mL	567
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	p-Xylene	1.85	mg/kg		p-Xylene/FC	0.000723	SH98-1610-2	780000	ug/mL	564
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	Total Xylenes (m,p, and o)	8.82	mg/kg		X/FC	0.003445	SH98-1610-2	780000	ug/mL	2687
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	Total BTEX	11.542	mg/kg		BTEX/FC	0.004509	SH98-1610-2	780000	ug/mL	3517
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	B+T	0.882	mg/kg		(B+T)/FC	0.000345	SH98-1610-2	780000	ug/mL	269
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	E+X	10.66	mg/kg		(E+X)/FC	0.004164	SH98-1610-2	780000	ug/mL	3248
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	B/T	0.60072595			(B/T)/FC	0.000235	SH98-1610-2	780000	ug/mL	183
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	B/E	0.1798913			(B/E)/FC	7.03E-05	SH98-1610-2	780000	ug/mL	55
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	B/X	0.03752834			(B/X)/FC	1.47E-05	SH98-1610-2	780000	ug/mL	11
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	T/E	0.29945652			(T/E)/FC	0.000117	SH98-1610-2	780000	ug/mL	91
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	T/X	0.06247166			(T/X)/FC	2.44E-05	SH98-1610-2	780000	ug/mL	19
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	E/X	0.20861678			(E/X)/FC	8.15E-05	SH98-1610-2	780000	ug/mL	64
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	(B+T)/(E+X)	0.08273921			((B+T)/(E+X))/FC	3.23E-05	SH98-1610-2	780000	ug/mL	25
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	Fuel Carbon	2560	mg/kg		Fuel Carbon	1	SH98-1610-2	780000	ug/mL	780000
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	1,2,3-Trimethylbenzene	3.38	mg/kg		1,2,3 TMB/FC	0.00132	SH98-1610-2	780000	ug/mL	1030
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	1,2,4-Trimethylbenzene	11.5	mg/kg		1,2,4 TMB/FC	0.004492	SH98-1610-2	780000	ug/mL	3504
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	1,3,5-Trimethylbenzene	4.83	mg/kg		1,3,5 TMB/FC	0.001887	SH98-1610-2	780000	ug/mL	1472
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	1-MethylNaphthalene	0.789	mg/kg		1-MN/FC	0.000308	SH98-1610-2	780000	ug/mL	240
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB1-27	2-MethylNaphthalene	1.5	mg/kg		2-MN/FC	0.000586	SH98-1610-2	780000	ug/mL	457
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	Benzene	0.394	mg/kg		B/FC	0.000149	SH98-1610-3	777000	ug/mL	116
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	Toluene	0.335	mg/kg		T/FC	0.000127	SH98-1610-3	777000	ug/mL	99
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	Ethylbenzene	3.9	mg/kg		E/FC	0.001477	SH98-1610-3	777000	ug/mL	1148
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	m-Xylene	12.5	mg/kg		m-Xylene/FC	0.004735	SH98-1610-3	777000	ug/mL	3679
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	o-Xylene	7.18	mg/kg		o-Xylene/FC	0.00272	SH98-1610-3	777000	ug/mL	2113
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	p-Xylene	4.43	mg/kg		p-Xylene/FC	0.001678	SH98-1610-3	777000	ug/mL	1304
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	Total Xylenes (m,p, and o)	24.11	mg/kg		X/FC	0.009133	SH98-1610-3	777000	ug/mL	7096
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	Total BTEX	28.739	mg/kg		BTEX/FC	0.010886	SH98-1610-3	777000	ug/mL	8458
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	B+T	0.729	mg/kg		(B+T)/FC	0.000276	SH98-1610-3	777000	ug/mL	215
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	E+X	28.01	mg/kg		(E+X)/FC	0.01061	SH98-1610-3	777000	ug/mL	8244
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	B/T	1.1761194			(B/T)/FC	0.000445	SH98-1610-3	777000	ug/mL	346
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	B/E	0.10102564			(B/E)/FC	3.83E-05	SH98-1610-3	777000	ug/mL	30
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	B/X	0.01634177			(B/X)/FC	6.19E-06	SH98-1610-3	777000	ug/mL	5
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	T/E	0.08589744			(T/E)/FC	3.25E-05	SH98-1610-3	777000	ug/mL	25
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	T/X	0.01389465			(T/X)/FC	5.26E-06	SH98-1610-3	777000	ug/mL	4
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	E/X	0.16175861			(E/X)/FC	6.13E-05	SH98-1610-3	777000	ug/mL	48
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	(B+T)/(E+X)	0.02602642			((B+T)/(E+X))/FC	9.86E-06	SH98-1610-3	777000	ug/mL	8
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	Fuel Carbon	2640	mg/kg		Fuel Carbon	1	SH98-1610-3	777000	ug/mL	777000
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	1,2,3-Trimethylbenzene	10.3	mg/kg		1,2,3 TMB/FC	0.003902	SH98-1610-3	777000	ug/mL	3031
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	1,2,4-Trimethylbenzene	24.7	mg/kg		1,2,4 TMB/FC	0.009356	SH98-1610-3	777000	ug/mL	7270
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	1,3,5-Trimethylbenzene	7.8	mg/kg		1,3,5 TMB/FC	0.002955	SH98-1610-3	777000	ug/mL	2296
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	1-MethylNaphthalene	4.42	mg/kg		1-MN/FC	0.001674	SH98-1610-3	777000	ug/mL	1301
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SH98-SB2-27	2-MethylNaphthalene	7.11	mg/kg		2-MN/FC	0.002693	SH98-1610-3	777000	ug/mL	2093
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	Benzene	0.544	mg/kg		B/FC	0.002909	SHMW1610-2	765000	ug/mL	2225
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	Toluene	0.787	mg/kg		T/FC	0.004209	SHMW1610-2	765000	ug/mL	3220
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	Ethylbenzene	0.224	mg/kg		E/FC	0.001198	SHMW1610-2	765000	ug/mL	916
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	m-Xylene	0.78	mg/kg		m-Xylene/FC	0.004171	SHMW1610-2	765000	ug/mL	3191
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	o-Xylene	0.581	mg/kg		o-Xylene/FC	0.003107	SHMW1610-2	765000	ug/mL	2377
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	p-Xylene	0.257	mg/kg		p-Xylene/FC	0.001374	SHMW1610-2	765000	ug/mL	1051
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	Total Xylenes (m,p, and o)	1.618	mg/kg		X/FC	0.008652	SHMW1610-2	765000	ug/mL	6619
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	Total BTEX	3.173	mg/kg		BTEX/FC	0.016968	SHMW1610-2	765000	ug/mL	12980
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	B+T	1.331	mg/kg		(B+T)/FC	0.007118	SHMW1610-2	765000	ug/mL	5445
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	E+X	1.842	mg/kg		(E+X)/FC	0.00985	SHMW1610-2	765000	ug/mL	7535
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	B/T	0.69123253			(B/T)/FC	0.003696	SHMW1610-2	765000	ug/mL	2828
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	B/E	2.42857143			(B/E)/FC	0.012987	SHMW1610-2	765000	ug/mL	9935
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	B/X	0.33621755			(B/X)/FC	0.001798	SHMW1610-2	765000	ug/mL	1375
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	T/E	3.51339286			(T/E)/FC	0.018788	SHMW1610-2	765000	ug/mL	14373
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	T/X	0.48640297			(T/X)/FC	0.002601	SHMW1610-2	765000	ug/mL	1990
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	E/X	0.13844252			(E/X)/FC	0.00074	SHMW1610-2	765000	ug/mL	566
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	(B+T)/(E+X)	0.72258415			((B+T)/(E+X))/FC	0.003864	SHMW1610-2	765000	ug/mL	2956
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	Fuel Carbon	187	mg/kg		Fuel Carbon	1	SHMW1610-2	765000	ug/mL	765000
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	1,2,3-Trimethylbenzene	0.919	mg/kg		1,2,3 TMB/FC	0.004914	SHMW1610-2	765000	ug/mL	3760

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	1,2,4-Trimethylbenzene	1.74	mg/kg		1,2,4 TMB/FC	0.009305	SHMW1610-2	765000	ug/mL	7118
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	1,3,5-Trimethylbenzene	0.527	mg/kg		1,3,5 TMB/FC	0.002818	SHMW1610-2	765000	ug/mL	2156
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	1-MethylNaphthalene	0.456	mg/kg		1-MN/FC	0.002439	SHMW1610-2	765000	ug/mL	1865
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-1-33'	2-MethylNaphthalene	0.72	mg/kg		2-MN/FC	0.00385	SHMW1610-2	765000	ug/mL	2945
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	Benzene	5.08	mg/kg		B/FC	0.002117	SHMW1610-3	783000	ug/mL	1657
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	Toluene	10.8	mg/kg		T/FC	0.0045	SHMW1610-3	783000	ug/mL	3524
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	Ethylbenzene	3.58	mg/kg		E/FC	0.001492	SHMW1610-3	783000	ug/mL	1168
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	m-Xylene	12.2	mg/kg		m-Xylene/FC	0.005083	SHMW1610-3	783000	ug/mL	3980
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	o-Xylene	8.92	mg/kg		o-Xylene/FC	0.003717	SHMW1610-3	783000	ug/mL	2910
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	p-Xylene	4.17	mg/kg		p-Xylene/FC	0.001738	SHMW1610-3	783000	ug/mL	1360
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	Total Xylenes (m,p, and o)	25.29	mg/kg		X/FC	0.010538	SHMW1610-3	783000	ug/mL	8251
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	Total BTEX	44.75	mg/kg		BTEX/FC	0.018646	SHMW1610-3	783000	ug/mL	14600
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	B+T	15.88	mg/kg		(B+T)/FC	0.006617	SHMW1610-3	783000	ug/mL	5181
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	E+X	28.87	mg/kg		(E+X)/FC	0.012029	SHMW1610-3	783000	ug/mL	9419
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	B/T	0.47037037			(B/T)/FC	0.000196	SHMW1610-3	783000	ug/mL	153
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	B/E	1.41899441			(B/E)/FC	0.000591	SHMW1610-3	783000	ug/mL	463
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	B/X	0.20086991			(B/X)/FC	8.37E-05	SHMW1610-3	783000	ug/mL	66
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	T/E	3.01675978			(T/E)/FC	0.001257	SHMW1610-3	783000	ug/mL	984
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	T/X	0.42704626			(T/X)/FC	0.000178	SHMW1610-3	783000	ug/mL	139
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	E/X	0.14155793			(E/X)/FC	5.9E-05	SHMW1610-3	783000	ug/mL	46
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	(B+T)/(E+X)	0.55005196			((B+T)/(E+X))/FC	0.000229	SHMW1610-3	783000	ug/mL	179
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	Fuel Carbon	2400	mg/kg		Fuel Carbon	1	SHMW1610-3	783000	ug/mL	783000
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	1,2,3-Trimethylbenzene	13.3	mg/kg		1,2,3 TMB/FC	0.005542	SHMW1610-3	783000	ug/mL	4339
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	1,2,4-Trimethylbenzene	25.2	mg/kg		1,2,4 TMB/FC	0.0105	SHMW1610-3	783000	ug/mL	8222
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	1,3,5-Trimethylbenzene	13.5	mg/kg		1,3,5 TMB/FC	0.005625	SHMW1610-3	783000	ug/mL	4404
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	1-MethylNaphthalene	5.31	mg/kg		1-MN/FC	0.002213	SHMW1610-3	783000	ug/mL	1732
NRMRL	JP-4	6/1/1994	######	Bldg 1610, Shaw AFB, SC	Soil	SHSB-2-33'	2-MethylNaphthalene	8.72	mg/kg		2-MN/FC	0.003633	SHMW1610-3	783000	ug/mL	2845
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	Benzene	0.006	mg/kg	**	B/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	Toluene	0.0173	mg/kg		T/FC	2.883333	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	Ethylbenzene	0.006	mg/kg	**	E/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	m-Xylene	0.006	mg/kg	**	m-Xylene/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	o-Xylene	0.006	mg/kg	**	o-Xylene/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	p-Xylene	0.006	mg/kg	**	p-Xylene/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	Total Xylenes (m,p, and o)	0.018	mg/kg		X/FC	3	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	Total BTEX	0.0473	mg/kg		BTEX/FC	7.883333	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	B+T	0.0233	mg/kg		(B+T)/FC	3.883333	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	E+X	0.024	mg/kg		(E+X)/FC	4	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	B/T	0.34682081			(B/T)/FC	57.80347	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	B/E	1			(B/E)/FC	166.6667	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	B/X	0.33333333			(B/X)/FC	55.55556	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	T/E	2.88333333			(T/E)/FC	480.5556	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	T/X	0.96111111			(T/X)/FC	160.1852	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	E/X	0.33333333			(E/X)/FC	55.55556	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	(B+T)/(E+X)	0.97083333			((B+T)/(E+X))/FC	161.8056	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	Fuel Carbon	0.006	mg/kg	**	Fuel Carbon	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	1,2,3-Trimethylbenzene	0.006	mg/kg	**	1,2,3 TMB/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	1,2,4-Trimethylbenzene	0.006	mg/kg	**	1,2,4 TMB/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	1,3,5-Trimethylbenzene	0.006	mg/kg	**	1,3,5 TMB/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	1-MethylNaphthalene	0.006	mg/kg	**	1-MN/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB1-14.5'	2-MethylNaphthalene	0.006	mg/kg	**	2-MN/FC	1	CH-MW-103	760000	ug/mL	fuel carbon = nd
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	Benzene	0.0367	mg/kg		B/FC	0.000546	CH-EW6	796000	ug/mL	435
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	Toluene	0.0354	mg/kg		T/FC	0.000527	CH-EW6	796000	ug/mL	419
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	Ethylbenzene	0.134	mg/kg		E/FC	0.001994	CH-EW6	796000	ug/mL	1587
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	m-Xylene	0.452	mg/kg		m-Xylene/FC	0.006726	CH-EW6	796000	ug/mL	5354
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	o-Xylene	0.152	mg/kg		o-Xylene/FC	0.002262	CH-EW6	796000	ug/mL	1800
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	p-Xylene	0.199	mg/kg		p-Xylene/FC	0.002961	CH-EW6	796000	ug/mL	2357
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	Total Xylenes (m,p, and o)	0.803	mg/kg		X/FC	0.011949	CH-EW6	796000	ug/mL	9512
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	Total BTEX	1.0091	mg/kg		BTEX/FC	0.015016	CH-EW6	796000	ug/mL	11953
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	B+T	0.0721	mg/kg		(B+T)/FC	0.001073	CH-EW6	796000	ug/mL	854
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	E+X	0.937	mg/kg		(E+X)/FC	0.013943	CH-EW6	796000	ug/mL	11099
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	B/T	1.03672316			(B/T)/FC	0.015427	CH-EW6	796000	ug/mL	12280
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	B/E	0.2738806			(B/E)/FC	0.004076	CH-EW6	796000	ug/mL	3244
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	B/X	0.04570361			(B/X)/FC	0.00068	CH-EW6	796000	ug/mL	541
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	T/E	0.2641791			(T/E)/FC	0.003931	CH-EW6	796000	ug/mL	3129
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	T/X	0.04408468			(T/X)/FC	0.000656	CH-EW6	796000	ug/mL	522

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	E/X	0.16687422			(E/X)/FC	0.002483	CH-EW6	796000	ug/mL	1977
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	(B+T)/(E+X)	0.07694771			((B+T)/(E+X))/FC	0.001145	CH-EW6	796000	ug/mL	911
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	Fuel Carbon	67.2	mg/kg		Fuel Carbon	1	CH-EW6	796000	ug/mL	796000
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	1,2,3-Trimethylbenzene	0.168	mg/kg		1,2,3 TMB/FC	0.0025	CH-EW6	796000	ug/mL	1990
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	1,2,4-Trimethylbenzene	0.331	mg/kg		1,2,4 TMB/FC	0.004926	CH-EW6	796000	ug/mL	3921
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	1,3,5-Trimethylbenzene	0.167	mg/kg		1,3,5 TMB/FC	0.002485	CH-EW6	796000	ug/mL	1978
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	1-MethylNaphthalene	0.189	mg/kg		1-MN/FC	0.002813	CH-EW6	796000	ug/mL	2239
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-12'	2-MethylNaphthalene	0.236	mg/kg		2-MN/FC	0.003512	CH-EW6	796000	ug/mL	2795
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	Benzene	1.05	mg/kg		B/FC	0.000107	CH-EW6	796000	ug/mL	85
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	Toluene	21.7	mg/kg		T/FC	0.002217	CH-EW6	796000	ug/mL	1764
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	Ethylbenzene	34.3	mg/kg		E/FC	0.003504	CH-EW6	796000	ug/mL	2789
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	m-Xylene	90	mg/kg		m-Xylene/FC	0.009193	CH-EW6	796000	ug/mL	7318
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	o-Xylene	45.2	mg/kg		o-Xylene/FC	0.004617	CH-EW6	796000	ug/mL	3675
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	p-Xylene	38	mg/kg		p-Xylene/FC	0.003882	CH-EW6	796000	ug/mL	3090
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	Total Xylenes (m,p, and o)	173.2	mg/kg		X/FC	0.017692	CH-EW6	796000	ug/mL	14082
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	Total BTEX	230.25	mg/kg		BTEX/FC	0.023519	CH-EW6	796000	ug/mL	18721
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	B+T	22.75	mg/kg		(B+T)/FC	0.002324	CH-EW6	796000	ug/mL	1850
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	E+X	207.5	mg/kg		(E+X)/FC	0.021195	CH-EW6	796000	ug/mL	16871
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	B/T	0.0483871			(B/T)/FC	4.94E-06	CH-EW6	796000	ug/mL	4
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	B/E	0.03061224			(B/E)/FC	3.13E-06	CH-EW6	796000	ug/mL	2
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	B/X	0.00606236			(B/X)/FC	6.19E-07	CH-EW6	796000	ug/mL	0
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	T/E	0.63265306			(T/E)/FC	6.46E-05	CH-EW6	796000	ug/mL	51
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	T/X	0.12528868			(T/X)/FC	1.28E-05	CH-EW6	796000	ug/mL	10
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	E/X	0.19803695			(E/X)/FC	2.02E-05	CH-EW6	796000	ug/mL	16
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	(B+T)/(E+X)	0.10963855			((B+T)/(E+X))/FC	1.12E-05	CH-EW6	796000	ug/mL	9
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	Fuel Carbon	9790	mg/kg		Fuel Carbon	1	CH-EW6	796000	ug/mL	796000
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	1,2,3-Trimethylbenzene	21.4	mg/kg		1,2,3 TMB/FC	0.002186	CH-EW6	796000	ug/mL	1740
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	1,2,4-Trimethylbenzene	45.9	mg/kg		1,2,4 TMB/FC	0.004688	CH-EW6	796000	ug/mL	3732
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	1,3,5-Trimethylbenzene	21.7	mg/kg		1,3,5 TMB/FC	0.002217	CH-EW6	796000	ug/mL	1764
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	1-MethylNaphthalene	26.8	mg/kg		1-MN/FC	0.002737	CH-EW6	796000	ug/mL	2179
NRMRL	JP-4	10/1/1975	######	DFSP-Charleston, Tank 1 Area, Hanahan, SC	Soil	CHSB2-13'	2-MethylNaphthalene	33.7	mg/kg		2-MN/FC	0.003442	CH-EW6	796000	ug/mL	2740
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	Benzene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	Toluene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	Ethylbenzene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	m-Xylene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	o-Xylene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	p-Xylene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	Total Xylenes (m,p, and o)	0.018	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	Total BTEX	0.036	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	B+T	0.012	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	E+X	0.024	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	B/T	1								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	B/E	1								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	B/X	0.33333333								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	T/E	1								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	T/X	0.33333333								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	E/X	0.33333333								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	(B+T)/(E+X)	0.5								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	1,2,3-Trimethylbenzene	0.0475	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	1,2,4-Trimethylbenzene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	1,3,5-Trimethylbenzene	0.28	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	1-MethylNaphthalene	0.117	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB4	2-MethylNaphthalene	0.144	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	Benzene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	Toluene	0.0855	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	Ethylbenzene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	m-Xylene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	o-Xylene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	p-Xylene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	Total Xylenes (m,p, and o)	0.018	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	Total BTEX	0.1155	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	B+T	0.0915	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	E+X	0.024	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	B/T	0.07017544								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	B/E	1								No FP/No FC data

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	B/X	0.33333333								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	T/E	14.25								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	T/X	4.75								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	E/X	0.33333333								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	(B+T)/(E+X)	3.8125								No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	1,2,3-Trimethylbenzene	0.0514	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	1,2,4-Trimethylbenzene	0.006	mg/kg	**						No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	1,3,5-Trimethylbenzene	0.3	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	1-MethylNaphthalene	0.118	mg/kg							No FP/No FC data
NRMRL	JP-4	10/1/1988	######	KC-135 Crash Site, Wurtsmith AFB, MI	Soil	SB5	2-MethylNaphthalene	0.158	mg/kg							No FP/No FC data
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	Benzene	1.1	mg/kg		B/FC	0.002048	MBMW8I	750000	ug/mL	1536
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	Toluene	0.006	mg/kg	**	T/FC	1.12E-05	MBMW8I	750000	ug/mL	8
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	Ethylbenzene	2.38	mg/kg		E/FC	0.004432	MBMW8I	750000	ug/mL	3324
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	m-Xylene	5.69	mg/kg		m-Xylene/FC	0.010596	MBMW8I	750000	ug/mL	7947
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	o-Xylene	0.131	mg/kg		o-Xylene/FC	0.000244	MBMW8I	750000	ug/mL	183
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	p-Xylene	1.1	mg/kg		p-Xylene/FC	0.002048	MBMW8I	750000	ug/mL	1536
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	Total Xylenes (m,p, and o)	6.921	mg/kg		X/FC	0.012888	MBMW8I	750000	ug/mL	9666
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	Total BTEX	10.407	mg/kg		BTEX/FC	0.01938	MBMW8I	750000	ug/mL	14535
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	B+T	1.106	mg/kg		(B+T)/FC	0.00206	MBMW8I	750000	ug/mL	1545
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	E+X	9.301	mg/kg		(E+X)/FC	0.01732	MBMW8I	750000	ug/mL	12990
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	B/T	183.333333			(B/T)/FC	0.341403	MBMW8I	750000	ug/mL	256052
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	B/E	0.46218487			(B/E)/FC	0.000861	MBMW8I	750000	ug/mL	646
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	B/X	0.15893657			(B/X)/FC	0.000296	MBMW8I	750000	ug/mL	222
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	T/E	0.00252101			(T/E)/FC	4.69E-06	MBMW8I	750000	ug/mL	4
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	T/X	0.00086693			(T/X)/FC	1.61E-06	MBMW8I	750000	ug/mL	1
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	E/X	0.34388094			(E/X)/FC	0.00064	MBMW8I	750000	ug/mL	480
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	(B+T)/(E+X)	0.11891194			((B+T)/(E+X))/FC	0.000221	MBMW8I	750000	ug/mL	166
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	Fuel Carbon	537	mg/kg		Fuel Carbon	1	MBMW8I	750000	ug/mL	750000
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	1,2,3-Trimethylbenzene	4.17	mg/kg		1,2,3 TMB/FC	0.007765	MBMW8I	750000	ug/mL	5824
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	1,2,4-Trimethylbenzene	9.66	mg/kg		1,2,4 TMB/FC	0.017989	MBMW8I	750000	ug/mL	13492
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	1,3,5-Trimethylbenzene	2.82	mg/kg		1,3,5 TMB/FC	0.005251	MBMW8I	750000	ug/mL	3939
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	1-MethylNaphthalene	2.71	mg/kg		1-MN/FC	0.005047	MBMW8I	750000	ug/mL	3785
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-1-9.5'	2-MethylNaphthalene	3.93	mg/kg		2-MN/FC	0.007318	MBMW8I	750000	ug/mL	5489
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	Benzene	1.71	mg/kg		B/FC	0.000615	MBMW24	764000	ug/mL	470
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	Toluene	0.0303	mg/kg		T/FC	1.09E-05	MBMW24	764000	ug/mL	8
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	Ethylbenzene	8.47	mg/kg		E/FC	0.003047	MBMW24	764000	ug/mL	2328
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	m-Xylene	10.9	mg/kg		m-Xylene/FC	0.003921	MBMW24	764000	ug/mL	2996
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	o-Xylene	0.0503	mg/kg		o-Xylene/FC	1.81E-05	MBMW24	764000	ug/mL	14
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	p-Xylene	0.497	mg/kg		p-Xylene/FC	0.000179	MBMW24	764000	ug/mL	137
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	Total Xylenes (m,p, and o)	11.4473	mg/kg		X/FC	0.004118	MBMW24	764000	ug/mL	3146
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	Total BTEX	21.6576	mg/kg		BTEX/FC	0.007791	MBMW24	764000	ug/mL	5952
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	B+T	1.7403	mg/kg		(B+T)/FC	0.000626	MBMW24	764000	ug/mL	478
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	E+X	19.9173	mg/kg		(E+X)/FC	0.007164	MBMW24	764000	ug/mL	5474
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	B/T	56.4356436			(B/T)/FC	0.020301	MBMW24	764000	ug/mL	15510
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	B/E	0.20188902			(B/E)/FC	7.26E-05	MBMW24	764000	ug/mL	55
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	B/X	0.1493802			(B/X)/FC	5.37E-05	MBMW24	764000	ug/mL	41
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	T/E	0.00357733			(T/E)/FC	1.29E-06	MBMW24	764000	ug/mL	1
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	T/X	0.00264691			(T/X)/FC	9.52E-07	MBMW24	764000	ug/mL	1
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	E/X	0.73991247			(E/X)/FC	0.000266	MBMW24	764000	ug/mL	203
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	(B+T)/(E+X)	0.0873763			((B+T)/(E+X))/FC	3.14E-05	MBMW24	764000	ug/mL	24
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	Fuel Carbon	2780	mg/kg		Fuel Carbon	1	MBMW24	764000	ug/mL	764000
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	1,2,3-Trimethylbenzene	14.7	mg/kg		1,2,3 TMB/FC	0.005288	MBMW24	764000	ug/mL	4040
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	1,2,4-Trimethylbenzene	36.4	mg/kg		1,2,4 TMB/FC	0.013094	MBMW24	764000	ug/mL	10003
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	1,3,5-Trimethylbenzene	9.51	mg/kg		1,3,5 TMB/FC	0.003421	MBMW24	764000	ug/mL	2614
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	1-MethylNaphthalene	7.62	mg/kg		1-MN/FC	0.002741	MBMW24	764000	ug/mL	2094
NRMRL	JP-4	1/1/1981	######	Pipeline Leak Site, Myrtle Beach AFB, SC	Soil	MBSB-2-9.5'	2-MethylNaphthalene	11.5	mg/kg		2-MN/FC	0.004137	MBMW24	764000	ug/mL	3160
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	Benzene	10.8	mg/kg		B/FC	0.00345	EAKMW316-FP	770400	ug/mL	2658
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	Toluene	0.039	mg/kg		T/FC	1.25E-05	EAKMW316-FP	770400	ug/mL	10
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	Ethylbenzene	16.6	mg/kg		E/FC	0.005304	EAKMW316-FP	770400	ug/mL	4086
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	m-Xylene	43.7	mg/kg		m-Xylene/FC	0.013962	EAKMW316-FP	770400	ug/mL	10756
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	o-Xylene	17.5	mg/kg		o-Xylene/FC	0.005591	EAKMW316-FP	770400	ug/mL	4307
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	p-Xylene	20.1	mg/kg		p-Xylene/FC	0.006422	EAKMW316-FP	770400	ug/mL	4947
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	Total Xylenes (m,p, and o)	81.3	mg/kg		X/FC	0.025974	EAKMW316-FP	770400	ug/mL	20011
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	Total BTEX	108.739	mg/kg		BTEX/FC	0.034741	EAKMW316-FP	770400	ug/mL	26764
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	B+T	10.839	mg/kg		(B+T)/FC	0.003463	EAKMW316-FP	770400	ug/mL	2668

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	E+X	97.9	mg/kg		(E+X)/FC	0.031278	EAKMW316-FP	770400	ug/mL	24097
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	B/T	276.923077			(B/T)/FC	0.088474	EAKMW316-FP	770400	ug/mL	68160
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	B/E	0.65060241			(B/E)/FC	0.000208	EAKMW316-FP	770400	ug/mL	160
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	B/X	0.13284133			(B/X)/FC	4.24E-05	EAKMW316-FP	770400	ug/mL	33
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	T/E	0.0023494			(T/E)/FC	7.51E-07	EAKMW316-FP	770400	ug/mL	1
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	T/X	0.0004797			(T/X)/FC	1.53E-07	EAKMW316-FP	770400	ug/mL	0
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	E/X	0.20418204			(E/X)/FC	6.52E-05	EAKMW316-FP	770400	ug/mL	50
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	(B+T)/(E+X)	0.11071502			((B+T)/(E+X))/FC	3.54E-05	EAKMW316-FP	770400	ug/mL	27
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	Fuel Carbon	3130	mg/kg		Fuel Carbon	1	EAKMW316-FP	770400	ug/mL	770400
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	1,2,3-Trimethylbenzene	12.2	mg/kg		1,2,3 TMB/FC	0.003898	EAKMW316-FP	770400	ug/mL	3003
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	1,2,4-Trimethylbenzene	36.2	mg/kg		1,2,4 TMB/FC	0.011565	EAKMW316-FP	770400	ug/mL	8910
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	1,3,5-Trimethylbenzene	19.6	mg/kg		1,3,5 TMB/FC	0.006262	EAKMW316-FP	770400	ug/mL	4824
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	1-MethylNaphthalene	6.44	mg/kg		1-MN/FC	0.002058	EAKMW316-FP	770400	ug/mL	1585
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB1-3	2-MethylNaphthalene	11.7	mg/kg		2-MN/FC	0.003738	EAKMW316-FP	770400	ug/mL	2880
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	Benzene	0.006	mg/kg	**	B/FC	2.06E-05	EAKMW306-FP	762600	ug/mL	16
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	Toluene	0.006	mg/kg	**	T/FC	2.06E-05	EAKMW306-FP	762600	ug/mL	16
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	Ethylbenzene	0.265	mg/kg		E/FC	0.000911	EAKMW306-FP	762600	ug/mL	694
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	m-Xylene	0.006	mg/kg	**	m-Xylene/FC	2.06E-05	EAKMW306-FP	762600	ug/mL	16
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	o-Xylene	0.006	mg/kg	**	o-Xylene/FC	2.06E-05	EAKMW306-FP	762600	ug/mL	16
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	p-Xylene	0.193	mg/kg		p-Xylene/FC	0.000663	EAKMW306-FP	762600	ug/mL	506
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	Total Xylenes (m,p, and o)	0.205	mg/kg		X/FC	0.000704	EAKMW306-FP	762600	ug/mL	537
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	Total BTEX	0.482	mg/kg		BTEX/FC	0.001656	EAKMW306-FP	762600	ug/mL	1263
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	B+T	0.012	mg/kg		(B+T)/FC	4.12E-05	EAKMW306-FP	762600	ug/mL	31
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	E+X	0.47	mg/kg		(E+X)/FC	0.001615	EAKMW306-FP	762600	ug/mL	1232
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	B/T	1			(B/T)/FC	0.003436	EAKMW306-FP	762600	ug/mL	2621
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	B/E	0.02264151			(B/E)/FC	7.78E-05	EAKMW306-FP	762600	ug/mL	59
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	B/X	0.02926829			(B/X)/FC	0.000101	EAKMW306-FP	762600	ug/mL	77
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	T/E	0.02264151			(T/E)/FC	7.78E-05	EAKMW306-FP	762600	ug/mL	59
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	T/X	0.02926829			(T/X)/FC	0.000101	EAKMW306-FP	762600	ug/mL	77
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	E/X	1.29268293			(E/X)/FC	0.004442	EAKMW306-FP	762600	ug/mL	3388
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	(B+T)/(E+X)	0.02553191			((B+T)/(E+X))/FC	8.77E-05	EAKMW306-FP	762600	ug/mL	67
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	Fuel Carbon	291	mg/kg		Fuel Carbon	1	EAKMW306-FP	762600	ug/mL	762600
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	1,2,3-Trimethylbenzene	0.682	mg/kg		1,2,3 TMB/FC	0.002344	EAKMW306-FP	762600	ug/mL	1787
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	1,2,4-Trimethylbenzene	1.99	mg/kg		1,2,4 TMB/FC	0.006838	EAKMW306-FP	762600	ug/mL	5215
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	1,3,5-Trimethylbenzene	0.692	mg/kg		1,3,5 TMB/FC	0.002378	EAKMW306-FP	762600	ug/mL	1813
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	1-MethylNaphthalene	0.535	mg/kg		1-MN/FC	0.001838	EAKMW306-FP	762600	ug/mL	1402
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-2	2-MethylNaphthalene	0.428	mg/kg		2-MN/FC	0.001471	EAKMW306-FP	762600	ug/mL	1122
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	Benzene	0.006	mg/kg	**	B/FC	3.73E-06	EAKMW306-FP	762600	ug/mL	3
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	Toluene	0.006	mg/kg	**	T/FC	3.73E-06	EAKMW306-FP	762600	ug/mL	3
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	Ethylbenzene	5.4	mg/kg		E/FC	0.003354	EAKMW306-FP	762600	ug/mL	2558
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	m-Xylene	0.877	mg/kg		m-Xylene/FC	0.000545	EAKMW306-FP	762600	ug/mL	415
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	o-Xylene	2.72	mg/kg		o-Xylene/FC	0.001689	EAKMW306-FP	762600	ug/mL	1288
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	p-Xylene	5.8	mg/kg		p-Xylene/FC	0.003602	EAKMW306-FP	762600	ug/mL	2747
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	Total Xylenes (m,p, and o)	9.397	mg/kg		X/FC	0.005837	EAKMW306-FP	762600	ug/mL	4451
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	Total BTEX	14.809	mg/kg		BTEX/FC	0.009198	EAKMW306-FP	762600	ug/mL	7014
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	B+T	0.012	mg/kg		(B+T)/FC	7.45E-06	EAKMW306-FP	762600	ug/mL	6
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	E+X	14.797	mg/kg		(E+X)/FC	0.009191	EAKMW306-FP	762600	ug/mL	7009
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	B/T	1			(B/T)/FC	0.000621	EAKMW306-FP	762600	ug/mL	474
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	B/E	0.00111111			(B/E)/FC	6.9E-07	EAKMW306-FP	762600	ug/mL	1
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	B/X	0.0006385			(B/X)/FC	3.97E-07	EAKMW306-FP	762600	ug/mL	0
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	T/E	0.00111111			(T/E)/FC	6.9E-07	EAKMW306-FP	762600	ug/mL	1
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	T/X	0.0006385			(T/X)/FC	3.97E-07	EAKMW306-FP	762600	ug/mL	0
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	E/X	0.57465148			(E/X)/FC	0.000357	EAKMW306-FP	762600	ug/mL	272
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	(B+T)/(E+X)	0.00081098			((B+T)/(E+X))/FC	5.04E-07	EAKMW306-FP	762600	ug/mL	0
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	Fuel Carbon	1610	mg/kg		Fuel Carbon	1	EAKMW306-FP	762600	ug/mL	762600
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	1,2,3-Trimethylbenzene	4.09	mg/kg		1,2,3 TMB/FC	0.00254	EAKMW306-FP	762600	ug/mL	1937
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	1,2,4-Trimethylbenzene	14.1	mg/kg		1,2,4 TMB/FC	0.008758	EAKMW306-FP	762600	ug/mL	6679
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	1,3,5-Trimethylbenzene	7.66	mg/kg		1,3,5 TMB/FC	0.004758	EAKMW306-FP	762600	ug/mL	3628
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	1-MethylNaphthalene	3.74	mg/kg		1-MN/FC	0.002323	EAKMW306-FP	762600	ug/mL	1772
NRMRL	JP-4	10/1/1973	######	Spill Site No. 2, Eaker AFB, AR	Soil	EAKSB2-4	2-MethylNaphthalene	6.71	mg/kg		2-MN/FC	0.004168	EAKMW306-FP	762600	ug/mL	3178

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	Benzene	0.0457	mg/kg		B/FC	9.44215E-06	BFT-401-3	804400	ug/mL	8
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	Toluene	0.56	mg/kg		T/FC	0.000115702	BFT-401-3	804400	ug/mL	93
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	Ethylbenzene	3.35	mg/kg		E/FC	0.000692149	BFT-401-3	804400	ug/mL	557
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	m-Xylene	5.02	mg/kg		m-Xylene/FC	0.00103719	BFT-401-3	804400	ug/mL	834
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	o-Xylene	3.95	mg/kg		o-Xylene/FC	0.000816116	BFT-401-3	804400	ug/mL	656
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	p-Xylene	1.98	mg/kg		p-Xylene/FC	0.000409091	BFT-401-3	804400	ug/mL	329
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	Total Xylenes (m,p, and o)	10.95	mg/kg		X/FC	0.002262397	BFT-401-3	804400	ug/mL	1820
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	Total BTEX	14.9057	mg/kg		BTEX/FC	0.00307969	BFT-401-3	804400	ug/mL	2477
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	B+T	0.6057	mg/kg		(B+T)/FC	0.000125145	BFT-401-3	804400	ug/mL	101
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	E+X	14.3	mg/kg		(E+X)/FC	0.002954545	BFT-401-3	804400	ug/mL	2377
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	B/T	0.08160714			(B/T)/FC	1.6861E-05	BFT-401-3	804400	ug/mL	14
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	B/E	0.01364179			(B/E)/FC	2.81855E-06	BFT-401-3	804400	ug/mL	2
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	B/X	0.00417352			(B/X)/FC	8.62297E-07	BFT-401-3	804400	ug/mL	1
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	T/E	0.16716418			(T/E)/FC	3.45381E-05	BFT-401-3	804400	ug/mL	28
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	T/X	0.05114155			(T/X)/FC	1.05664E-05	BFT-401-3	804400	ug/mL	8
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	E/X	0.30593607			(E/X)/FC	6.32099E-05	BFT-401-3	804400	ug/mL	51
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	(B+T)/(E+X)	0.04235664			((B+T)/(E+X))/FC	8.75137E-06	BFT-401-3	804400	ug/mL	7
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	Fuel Carbon	4840	mg/kg		Fuel Carbon	1	BFT-401-3	804400	ug/mL	804400
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	1,2,3-Trimethylbenzene	20.6	mg/kg		1,2,3 TMB/FC	0.004256198	BFT-401-3	804400	ug/mL	3424
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	1,2,4-Trimethylbenzene	33.4	mg/kg		1,2,4 TMB/FC	0.006900826	BFT-401-3	804400	ug/mL	5551
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	1,3,5-Trimethylbenzene	9.58	mg/kg		1,3,5 TMB/FC	0.001979339	BFT-401-3	804400	ug/mL	1592
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	1-MethylNaphthalene	20.5	mg/kg		1-MN/FC	0.004235537	BFT-401-3	804400	ug/mL	3407
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB1-4'	2-MethylNaphthalene	27.4	mg/kg		2-MN/FC	0.005661157	BFT-401-3	804400	ug/mL	4554
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	Benzene	0.375	mg/kg		B/FC	1.84729E-05	BFT-401-3	804400	ug/mL	15
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	Toluene	0.382	mg/kg		T/FC	1.88177E-05	BFT-401-3	804400	ug/mL	15
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	Ethylbenzene	15.3	mg/kg		E/FC	0.000753695	BFT-401-3	804400	ug/mL	606
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	m-Xylene	22.9	mg/kg		m-Xylene/FC	0.001128079	BFT-401-3	804400	ug/mL	907
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	o-Xylene	13.7	mg/kg		o-Xylene/FC	0.000674877	BFT-401-3	804400	ug/mL	543
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	p-Xylene	8.94	mg/kg		p-Xylene/FC	0.000440394	BFT-401-3	804400	ug/mL	354
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	Total Xylenes (m,p, and o)	45.54	mg/kg		X/FC	0.00224335	BFT-401-3	804400	ug/mL	1805
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	Total BTEX	61.597	mg/kg		BTEX/FC	0.003034335	BFT-401-3	804400	ug/mL	2441
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	B+T	0.757	mg/kg		(B+T)/FC	3.72906E-05	BFT-401-3	804400	ug/mL	30
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	E+X	60.84	mg/kg		(E+X)/FC	0.002997044	BFT-401-3	804400	ug/mL	2411
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	B/T	0.98167539			(B/T)/FC	4.83584E-05	BFT-401-3	804400	ug/mL	39
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	B/E	0.0245098			(B/E)/FC	1.20738E-06	BFT-401-3	804400	ug/mL	1
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	B/X	0.00823452			(B/X)/FC	4.05641E-07	BFT-401-3	804400	ug/mL	0
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	T/E	0.02496732			(T/E)/FC	1.22992E-06	BFT-401-3	804400	ug/mL	1
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	T/X	0.00838823			(T/X)/FC	4.13213E-07	BFT-401-3	804400	ug/mL	0
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	E/X	0.33596838			(E/X)/FC	1.65502E-05	BFT-401-3	804400	ug/mL	13
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	(B+T)/(E+X)	0.01244247			((B+T)/(E+X))/FC	6.1293E-07	BFT-401-3	804400	ug/mL	0
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	Fuel Carbon	20300	mg/kg		Fuel Carbon	1	BFT-401-3	804400	ug/mL	804400
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	1,2,3-Trimethylbenzene	95.5	mg/kg		1,2,3 TMB/FC	0.004704433	BFT-401-3	804400	ug/mL	3784
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	1,2,4-Trimethylbenzene	148	mg/kg		1,2,4 TMB/FC	0.00729064	BFT-401-3	804400	ug/mL	5865
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	1,3,5-Trimethylbenzene	43.5	mg/kg		1,3,5 TMB/FC	0.002142857	BFT-401-3	804400	ug/mL	1724
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	1-MethylNaphthalene	87.3	mg/kg		1-MN/FC	0.004300493	BFT-401-3	804400	ug/mL	3459
NRMRL	JP-5	6/1/1990	######	Tank Farm C, Beaufort MCAS, SC	Soil	BUTFC-SB2-3.5'	2-MethylNaphthalene	115	mg/kg		2-MN/FC	0.005665025	BFT-401-3	804400	ug/mL	4557
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	Benzene	3.25	mg/kg		B/FC	0.000770142	ASSUMEdens	804400	ug/mL	620
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	Toluene	0.0786	mg/kg		T/FC	1.86256E-05	ASSUMEdens	804400	ug/mL	15
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	Ethylbenzene	23.9	mg/kg		E/FC	0.005663507	ASSUMEdens	804400	ug/mL	4556
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	m-Xylene	0.006	mg/kg	**	m-Xylene/FC	1.4218E-06	ASSUMEdens	804400	ug/mL	1
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	o-Xylene	0.0812	mg/kg		o-Xylene/FC	1.92417E-05	ASSUMEdens	804400	ug/mL	15
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	p-Xylene	0.006	mg/kg	**	p-Xylene/FC	1.4218E-06	ASSUMEdens	804400	ug/mL	1
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	Total Xylenes (m,p, and o)	0.0932	mg/kg		X/FC	2.20853E-05	ASSUMEdens	804400	ug/mL	18
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	Total BTEX	27.3218	mg/kg		BTEX/FC	0.00647436	ASSUMEdens	804400	ug/mL	5208
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	B+T	3.3286	mg/kg		(B+T)/FC	0.000788768	ASSUMEdens	804400	ug/mL	634
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	E+X	23.9932	mg/kg		(E+X)/FC	0.005685592	ASSUMEdens	804400	ug/mL	4573
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	B/T	41.3486005			(B/T)/FC	0.009798247	ASSUMEdens	804400	ug/mL	7882
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	B/E	0.13598326			(B/E)/FC	3.22235E-05	ASSUMEdens	804400	ug/mL	26
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	B/X	34.8712446			(B/X)/FC	0.008263328	ASSUMEdens	804400	ug/mL	6647
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	T/E	0.0032887			(T/E)/FC	7.79313E-07	ASSUMEdens	804400	ug/mL	1
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	T/X	0.84334764			(T/X)/FC	0.000199845	ASSUMEdens	804400	ug/mL	161
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	E/X	256.437768			(E/X)/FC	0.060767244	ASSUMEdens	804400	ug/mL	48881
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	(B+T)/(E+X)	0.13873097			((B+T)/(E+X))/FC	3.28746E-05	ASSUMEdens	804400	ug/mL	26
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	Fuel Carbon	4220	mg/kg		Fuel Carbon	1	ASSUMEdens	804400	ug/mL	804400
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	1,2,3-Trimethylbenzene	28	mg/kg		1,2,3 TMB/FC	0.006635071	ASSUMEdens	804400	ug/mL	5337
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	1,2,4-Trimethylbenzene	0.287	mg/kg		1,2,4 TMB/FC	6.80095E-05	ASSUMEdens	804400	ug/mL	55

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	1,3,5-Trimethylbenzene	0.014	mg/kg		1,3,5 TMB/FC	3.31754E-06	ASSUMEdens	804400	ug/mL	3
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	1-MethylNaphthalene	29.8	mg/kg		1-MN/FC	0.007061611	ASSUMEdens	804400	ug/mL	5680
NRMRL	JP-5	6/1/1974	######	Day Tank 865, Beaufort MCAS, SC	Soil	BUDTSB-3.5'	2-MethylNaphthalene	44.3	mg/kg		2-MN/FC	0.01049763	ASSUMEdens	804400	ug/mL	8444
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	Benzene	0.953	mg/kg		B/FC	3.32056E-05	CEF-293-9FP	799000	ug/mL	27
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	Toluene	17.2	mg/kg		T/FC	0.000599303	CEF-293-9FP	799000	ug/mL	479
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	Ethylbenzene	141	mg/kg		E/FC	0.004912892	CEF-293-9FP	799000	ug/mL	3925
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	m-Xylene	233	mg/kg		m-Xylene/FC	0.008118467	CEF-293-9FP	799000	ug/mL	6487
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	o-Xylene	32.8	mg/kg		o-Xylene/FC	0.001142857	CEF-293-9FP	799000	ug/mL	913
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	p-Xylene	114	mg/kg		p-Xylene/FC	0.003972125	CEF-293-9FP	799000	ug/mL	3174
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	Total Xylenes (m,p, and o)	379.8	mg/kg		X/FC	0.013233449	CEF-293-9FP	799000	ug/mL	10574
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	Total BTEX	538.953	mg/kg		BTEX/FC	0.01877885	CEF-293-9FP	799000	ug/mL	15004
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	B+T	18.153	mg/kg		(B+T)/FC	0.000632509	CEF-293-9FP	799000	ug/mL	505
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	E+X	520.8	mg/kg		(E+X)/FC	0.018146341	CEF-293-9FP	799000	ug/mL	14499
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	B/T	0.05540698			(B/T)/FC	1.93056E-06	CEF-293-9FP	799000	ug/mL	2
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	B/E	0.00675887			(B/E)/FC	2.35501E-07	CEF-293-9FP	799000	ug/mL	0
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	B/X	0.00250922			(B/X)/FC	8.74291E-08	CEF-293-9FP	799000	ug/mL	0
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	T/E	0.12198582			(T/E)/FC	4.25038E-06	CEF-293-9FP	799000	ug/mL	3
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	T/X	0.04528699			(T/X)/FC	1.57794E-06	CEF-293-9FP	799000	ug/mL	1
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	E/X	0.37124803			(E/X)/FC	1.29355E-05	CEF-293-9FP	799000	ug/mL	10
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	(B+T)/(E+X)	0.03485599			((B+T)/(E+X))/FC	1.21449E-06	CEF-293-9FP	799000	ug/mL	1
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	Fuel Carbon	28700	mg/kg		Fuel Carbon	1	CEF-293-9FP	799000	ug/mL	799000
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	1,2,3-Trimethylbenzene	88.4	mg/kg		1,2,3 TMB/FC	0.003080139	CEF-293-9FP	799000	ug/mL	2461
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	1,2,4-Trimethylbenzene	210	mg/kg		1,2,4 TMB/FC	0.007317073	CEF-293-9FP	799000	ug/mL	5846
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	1,3,5-Trimethylbenzene	86.3	mg/kg		1,3,5 TMB/FC	0.003006969	CEF-293-9FP	799000	ug/mL	2403
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	1-MethylNaphthalene	84.3	mg/kg		1-MN/FC	0.002937282	CEF-293-9FP	799000	ug/mL	2347
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB1-8.5'	2-MethylNaphthalene	133	mg/kg		2-MN/FC	0.004634146	CEF-293-9FP	799000	ug/mL	3703
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	Benzene	0.976	mg/kg		B/FC	3.35395E-05	CEF-293-9FP	799000	ug/mL	27
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	Toluene	19.1	mg/kg		T/FC	0.000656357	CEF-293-9FP	799000	ug/mL	524
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	Ethylbenzene	155	mg/kg		E/FC	0.00532646	CEF-293-9FP	799000	ug/mL	4256
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	m-Xylene	263	mg/kg		m-Xylene/FC	0.009037801	CEF-293-9FP	799000	ug/mL	7221
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	o-Xylene	37.4	mg/kg		o-Xylene/FC	0.001285223	CEF-293-9FP	799000	ug/mL	1027
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	p-Xylene	125	mg/kg		p-Xylene/FC	0.004295533	CEF-293-9FP	799000	ug/mL	3432
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	Total Xylenes (m,p, and o)	425.4	mg/kg		X/FC	0.014618557	CEF-293-9FP	799000	ug/mL	11680
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	Total BTEX	600.476	mg/kg		BTEX/FC	0.020634914	CEF-293-9FP	799000	ug/mL	16487
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	B+T	20.076	mg/kg		(B+T)/FC	0.000689897	CEF-293-9FP	799000	ug/mL	551
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	E+X	580.4	mg/kg		(E+X)/FC	0.019945017	CEF-293-9FP	799000	ug/mL	15936
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	B/T	0.05109948			(B/T)/FC	1.756E-06	CEF-293-9FP	799000	ug/mL	1
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	B/E	0.00629677			(B/E)/FC	2.16384E-07	CEF-293-9FP	799000	ug/mL	0
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	B/X	0.00229431			(B/X)/FC	7.88423E-08	CEF-293-9FP	799000	ug/mL	0
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	T/E	0.12322581			(T/E)/FC	4.23456E-06	CEF-293-9FP	799000	ug/mL	3
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	T/X	0.04489892			(T/X)/FC	1.54292E-06	CEF-293-9FP	799000	ug/mL	1
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	E/X	0.36436295			(E/X)/FC	1.25211E-05	CEF-293-9FP	799000	ug/mL	10
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	(B+T)/(E+X)	0.03458994			((B+T)/(E+X))/FC	1.18866E-06	CEF-293-9FP	799000	ug/mL	1
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	Fuel Carbon	29100	mg/kg		Fuel Carbon	1	CEF-293-9FP	799000	ug/mL	799000
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	1,2,3-Trimethylbenzene	99.8	mg/kg		1,2,3 TMB/FC	0.003429553	CEF-293-9FP	799000	ug/mL	2740
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	1,2,4-Trimethylbenzene	238	mg/kg		1,2,4 TMB/FC	0.008178694	CEF-293-9FP	799000	ug/mL	6535
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	1,3,5-Trimethylbenzene	96.9	mg/kg		1,3,5 TMB/FC	0.003329897	CEF-293-9FP	799000	ug/mL	2661
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	1-MethylNaphthalene	94.4	mg/kg		1-MN/FC	0.003243986	CEF-293-9FP	799000	ug/mL	2592
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB11-8.5'	2-MethylNaphthalene	150	mg/kg		2-MN/FC	0.005154639	CEF-293-9FP	799000	ug/mL	4119
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	Benzene	0.012	mg/kg		B/FC	3.64742E-06	ASSUMEdens	799000	ug/mL	3
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	Toluene	0.208	mg/kg		T/FC	6.32219E-05	ASSUMEdens	799000	ug/mL	51
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	Ethylbenzene	1.47	mg/kg		E/FC	0.000446809	ASSUMEdens	799000	ug/mL	357
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	m-Xylene	3.26	mg/kg		m-Xylene/FC	0.000990881	ASSUMEdens	799000	ug/mL	792
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	o-Xylene	0.666	mg/kg		o-Xylene/FC	0.000202432	ASSUMEdens	799000	ug/mL	162
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	p-Xylene	1.31	mg/kg		p-Xylene/FC	0.000398176	ASSUMEdens	799000	ug/mL	318
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	Total Xylenes (m,p, and o)	5.236	mg/kg		X/FC	0.001591489	ASSUMEdens	799000	ug/mL	1272
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	Total BTEX	6.926	mg/kg		BTEX/FC	0.002105167	ASSUMEdens	799000	ug/mL	1682
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	B+T	0.22	mg/kg		(B+T)/FC	6.68693E-05	ASSUMEdens	799000	ug/mL	53
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	E+X	6.706	mg/kg		(E+X)/FC	0.002038298	ASSUMEdens	799000	ug/mL	1629
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	B/T	0.05769231			(B/T)/FC	1.75357E-05	ASSUMEdens	799000	ug/mL	14
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	B/E	0.00816327			(B/E)/FC	2.48124E-06	ASSUMEdens	799000	ug/mL	2
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	B/X	0.00229183			(B/X)/FC	6.96604E-07	ASSUMEdens	799000	ug/mL	1
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	T/E	0.1414966			(T/E)/FC	4.30081E-05	ASSUMEdens	799000	ug/mL	34
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	T/X	0.03972498			(T/X)/FC	1.20745E-05	ASSUMEdens	799000	ug/mL	10
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	E/X	0.28074866			(E/X)/FC	8.53339E-05	ASSUMEdens	799000	ug/mL	68
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	(B+T)/(E+X)	0.03280644			((B+T)/(E+X))/FC	9.97156E-06	ASSUMEdens	799000	ug/mL	8

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	Fuel Carbon	3290	mg/kg		Fuel Carbon	1	ASSUMEdens	799000	ug/mL	799000
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	1,2,3-Trimethylbenzene	13.9	mg/kg		1,2,3 TMB/FC	0.004224924	ASSUMEdens	799000	ug/mL	3376
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	1,2,4-Trimethylbenzene	21.5	mg/kg		1,2,4 TMB/FC	0.006534954	ASSUMEdens	799000	ug/mL	5221
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	1,3,5-Trimethylbenzene	7.05	mg/kg		1,3,5 TMB/FC	0.002142857	ASSUMEdens	799000	ug/mL	1712
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	1-MethylNaphthalene	16.4	mg/kg		1-MN/FC	0.004984802	ASSUMEdens	799000	ug/mL	3983
NRMRL	JP-5	6/1/1981	######	Facility 293, Cecil Field NAS, FL	Soil	CFSB3-8.5'	2-MethylNaphthalene	25.5	mg/kg		2-MN/FC	0.00775076	ASSUMEdens	799000	ug/mL	6193

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	Benzene	3.06	mg/kg		B/FC	0.000221739	SJ98-MW1S	818000	ug/mL	181
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	Toluene	17.2	mg/kg		T/FC	0.001246377	SJ98-MW1S	818000	ug/mL	1020
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	Ethylbenzene	24.3	mg/kg		E/FC	0.00176087	SJ98-MW1S	818000	ug/mL	1440
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	m-Xylene	53	mg/kg		m-Xylene/FC	0.00384058	SJ98-MW1S	818000	ug/mL	3142
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	o-Xylene	29.6	mg/kg		o-Xylene/FC	0.002144928	SJ98-MW1S	818000	ug/mL	1755
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	p-Xylene	18.9	mg/kg		p-Xylene/FC	0.001369565	SJ98-MW1S	818000	ug/mL	1120
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	Total Xylenes (m,p, and o)	101.5	mg/kg		X/FC	0.007355072	SJ98-MW1S	818000	ug/mL	6016
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	Total BTEX	146.06	mg/kg		BTEX/FC	0.010584058	SJ98-MW1S	818000	ug/mL	8658
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	B+T	20.26	mg/kg		(B+T)/FC	0.001468116	SJ98-MW1S	818000	ug/mL	1201
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	B/T	0.17790698			(B/T)/FC	1.28918E-05	SJ98-MW1S	818000	ug/mL	11
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	B/E	0.12592593			(B/E)/FC	9.12507E-06	SJ98-MW1S	818000	ug/mL	7
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	B/X	0.03014778			(B/X)/FC	2.18462E-06	SJ98-MW1S	818000	ug/mL	2
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	T/E	0.70781893			(T/E)/FC	5.12912E-05	SJ98-MW1S	818000	ug/mL	42
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	T/X	0.16945813			(T/X)/FC	1.22796E-05	SJ98-MW1S	818000	ug/mL	10
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	E/X	0.23940887			(E/X)/FC	1.73485E-05	SJ98-MW1S	818000	ug/mL	14
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	Fuel Carbon	13800	mg/kg		Fuel Carbon	1	SJ98-MW1S	818000	ug/mL	818000
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	1,2,3-Trimethylbenzene	60.4	mg/kg		1,2,3 TMB/FC	0.004376812	SJ98-MW1S	818000	ug/mL	3580
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	1,2,4-Trimethylbenzene	118	mg/kg		1,2,4 TMB/FC	0.008550725	SJ98-MW1S	818000	ug/mL	6994
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	1,3,5-Trimethylbenzene	38.3	mg/kg		1,3,5 TMB/FC	0.002775362	SJ98-MW1S	818000	ug/mL	2270
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	1-MethylNaphthalene	35	mg/kg		1-MN/FC	0.002536232	SJ98-MW1S	818000	ug/mL	2075
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB1-3	2-MethylNaphthalene	52.5	mg/kg		2-MN/FC	0.003804348	SJ98-MW1S	818000	ug/mL	3112
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	Benzene	3.47	mg/kg		B/FC	0.000164455	SJ98-MP2	812000	ug/mL	134
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	Toluene	34.6	mg/kg		T/FC	0.00163981	SJ98-MP2	812000	ug/mL	1332
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	Ethylbenzene	54.1	mg/kg		E/FC	0.002563981	SJ98-MP2	812000	ug/mL	2082
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	m-Xylene	103	mg/kg		m-Xylene/FC	0.004881517	SJ98-MP2	812000	ug/mL	3964
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	o-Xylene	67	mg/kg		o-Xylene/FC	0.003175355	SJ98-MP2	812000	ug/mL	2578
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	p-Xylene	38.4	mg/kg		p-Xylene/FC	0.001819905	SJ98-MP2	812000	ug/mL	1478
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	Total Xylenes (m,p, and o)	208.4	mg/kg		X/FC	0.009876777	SJ98-MP2	812000	ug/mL	8020
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	Total BTEX	300.57	mg/kg		BTEX/FC	0.014245024	SJ98-MP2	812000	ug/mL	11567
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	B+T	38.07	mg/kg		(B+T)/FC	0.001804265	SJ98-MP2	812000	ug/mL	1465
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	B/T	0.10028902			(B/T)/FC	4.75303E-06	SJ98-MP2	812000	ug/mL	4
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	B/E	0.06414048			(B/E)/FC	3.03983E-06	SJ98-MP2	812000	ug/mL	2
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	B/X	0.01665067			(B/X)/FC	7.89131E-07	SJ98-MP2	812000	ug/mL	1
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	T/E	0.63955638			(T/E)/FC	3.03107E-05	SJ98-MP2	812000	ug/mL	25
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	T/X	0.16602687			(T/X)/FC	7.86857E-06	SJ98-MP2	812000	ug/mL	6
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	E/X	0.25959693			(E/X)/FC	1.23032E-05	SJ98-MP2	812000	ug/mL	10
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	Fuel Carbon	21100	mg/kg		Fuel Carbon	1	SJ98-MP2	812000	ug/mL	812000
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	1,2,3-Trimethylbenzene	148	mg/kg		1,2,3 TMB/FC	0.007014218	SJ98-MP2	812000	ug/mL	5696
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	1,2,4-Trimethylbenzene	266	mg/kg		1,2,4 TMB/FC	0.012606635	SJ98-MP2	812000	ug/mL	10237
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	1,3,5-Trimethylbenzene	78.2	mg/kg		1,3,5 TMB/FC	0.003706161	SJ98-MP2	812000	ug/mL	3009
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	1-MethylNaphthalene	87.8	mg/kg		1-MN/FC	0.004161137	SJ98-MP2	812000	ug/mL	3379
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-3	2-MethylNaphthalene	128	mg/kg		2-MN/FC	0.006066351	SJ98-MP2	812000	ug/mL	4926
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	Benzene	1.82	mg/kg		B/FC	7.87879E-05	SJ98-MP2	812000	ug/mL	64
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	Toluene	29.3	mg/kg		T/FC	0.001268398	SJ98-MP2	812000	ug/mL	1030
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	Ethylbenzene	39.9	mg/kg		E/FC	0.001727273	SJ98-MP2	812000	ug/mL	1403
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	m-Xylene	64.6	mg/kg		m-Xylene/FC	0.002796537	SJ98-MP2	812000	ug/mL	2271
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	o-Xylene	41.6	mg/kg		o-Xylene/FC	0.001800866	SJ98-MP2	812000	ug/mL	1462
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	p-Xylene	21.3	mg/kg		p-Xylene/FC	0.000922078	SJ98-MP2	812000	ug/mL	749
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	Total Xylenes (m,p, and o)	127.5	mg/kg		X/FC	0.005519481	SJ98-MP2	812000	ug/mL	4482
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	Total BTEX	198.52	mg/kg		BTEX/FC	0.008593939	SJ98-MP2	812000	ug/mL	6978
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	B+T	31.12	mg/kg		(B+T)/FC	0.001347186	SJ98-MP2	812000	ug/mL	1094
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	B/T	0.06211604			(B/T)/FC	2.68901E-06	SJ98-MP2	812000	ug/mL	2
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	B/E	0.04561404			(B/E)/FC	1.97463E-06	SJ98-MP2	812000	ug/mL	2
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	B/X	0.01427451			(B/X)/FC	6.17944E-07	SJ98-MP2	812000	ug/mL	1
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	T/E	0.73433584			(T/E)/FC	3.17894E-05	SJ98-MP2	812000	ug/mL	26
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	T/X	0.22980392			(T/X)/FC	9.94822E-06	SJ98-MP2	812000	ug/mL	8
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	E/X	0.31294118			(E/X)/FC	1.35472E-05	SJ98-MP2	812000	ug/mL	11
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	Fuel Carbon	23100	mg/kg		Fuel Carbon	1	SJ98-MP2	812000	ug/mL	812000
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	1,2,3-Trimethylbenzene	98.1	mg/kg		1,2,3 TMB/FC	0.004246753	SJ98-MP2	812000	ug/mL	3448
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	1,2,4-Trimethylbenzene	206	mg/kg		1,2,4 TMB/FC	0.008917749	SJ98-MP2	812000	ug/mL	7241
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	1,3,5-Trimethylbenzene	48.6	mg/kg		1,3,5 TMB/FC	0.002103896	SJ98-MP2	812000	ug/mL	1708
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	1-MethylNaphthalene	60.4	mg/kg		1-MN/FC	0.002614719	SJ98-MP2	812000	ug/mL	2123
NRMRL	JP-8	12/1/1995	3/10/1998	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJ98-SB2-4	2-MethylNaphthalene	87.2	mg/kg		2-MN/FC	0.003774892	SJ98-MP2	812000	ug/mL	3065
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	Benzene	10.8	mg/kg		B/FC	0.000486486	SJMW1SFP	793000	ug/mL	386
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	Toluene	64.7	mg/kg		T/FC	0.002914414	SJMW1SFP	793000	ug/mL	2311
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	Ethylbenzene	56.1	mg/kg		E/FC	0.002527027	SJMW1SFP	793000	ug/mL	2004

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	m-Xylene	152	mg/kg		m-Xylene/FC	0.006846847	SJMW1SFP	793000	ug/mL	5430
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	o-Xylene	86.7	mg/kg		o-Xylene/FC	0.003905405	SJMW1SFP	793000	ug/mL	3097
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	p-Xylene	53.6	mg/kg		p-Xylene/FC	0.002414414	SJMW1SFP	793000	ug/mL	1915
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	Total Xylenes (m,p, and o)	292.3	mg/kg		X/FC	0.013166667	SJMW1SFP	793000	ug/mL	10441
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	Total BTEX	423.9	mg/kg		BTEX/FC	0.019094595	SJMW1SFP	793000	ug/mL	15142
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	B+T	75.5	mg/kg		(B+T)/FC	0.003400901	SJMW1SFP	793000	ug/mL	2697
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	E+X	348.4	mg/kg		(E+X)/FC	0.015693694	SJMW1SFP	793000	ug/mL	12445
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	B/T	0.16692427			(B/T)/FC	7.51911E-06	SJMW1SFP	793000	ug/mL	6
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	B/E	0.19251337			(B/E)/FC	8.67177E-06	SJMW1SFP	793000	ug/mL	7
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	B/X	0.03694834			(B/X)/FC	1.66434E-06	SJMW1SFP	793000	ug/mL	1
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	T/E	1.15329768			(T/E)/FC	5.19503E-05	SJMW1SFP	793000	ug/mL	41
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	T/X	0.22134793			(T/X)/FC	9.97063E-06	SJMW1SFP	793000	ug/mL	8
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	E/X	0.1919261			(E/X)/FC	8.64532E-06	SJMW1SFP	793000	ug/mL	7
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	(B+T)/(E+X)	0.21670494			((B+T)/(E+X))/FC	9.76148E-06	SJMW1SFP	793000	ug/mL	8
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	Fuel Carbon	22200	mg/kg		Fuel Carbon	1	SJMW1SFP	793000	ug/mL	793000
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	1,2,3-Trimethylbenzene	119	mg/kg		1,2,3 TMB/FC	0.00536036	SJMW1SFP	793000	ug/mL	4251
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	1,2,4-Trimethylbenzene	269	mg/kg		1,2,4 TMB/FC	0.012117117	SJMW1SFP	793000	ug/mL	9609
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	1,3,5-Trimethylbenzene	102	mg/kg		1,3,5 TMB/FC	0.004594595	SJMW1SFP	793000	ug/mL	3644
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	1-MethylNaphthalene	62.4	mg/kg		1-MN/FC	0.002810811	SJMW1SFP	793000	ug/mL	2229
NRMRL	JP-8	12/1/1995	5/14/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB1-5.5'	2-MethylNaphthalene	96.9	mg/kg		2-MN/FC	0.004364865	SJMW1SFP	793000	ug/mL	3461
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	Benzene	12.5	mg/kg		B/FC	0.000313283	SJMW1SFP	793000	ug/mL	248
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	Toluene	56.3	mg/kg		T/FC	0.001411028	SJMW1SFP	793000	ug/mL	1119
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	Ethylbenzene	75.3	mg/kg		E/FC	0.001887218	SJMW1SFP	793000	ug/mL	1497
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	m-Xylene	217	mg/kg		m-Xylene/FC	0.005438596	SJMW1SFP	793000	ug/mL	4313
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	o-Xylene	124	mg/kg		o-Xylene/FC	0.003107769	SJMW1SFP	793000	ug/mL	2464
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	p-Xylene	75.4	mg/kg		p-Xylene/FC	0.001889724	SJMW1SFP	793000	ug/mL	1499
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	Total Xylenes (m,p, and o)	416.4	mg/kg		X/FC	0.01043609	SJMW1SFP	793000	ug/mL	8276
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	Total BTEX	560.5	mg/kg		BTEX/FC	0.014047619	SJMW1SFP	793000	ug/mL	11140
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	B+T	68.8	mg/kg		(B+T)/FC	0.001724311	SJMW1SFP	793000	ug/mL	1367
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	E+X	491.7	mg/kg		(E+X)/FC	0.012323308	SJMW1SFP	793000	ug/mL	9772
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	B/T	0.22202487			(B/T)/FC	5.56453E-06	SJMW1SFP	793000	ug/mL	4
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	B/E	0.16600266			(B/E)/FC	4.16047E-06	SJMW1SFP	793000	ug/mL	3
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	B/X	0.03001921			(B/X)/FC	7.52361E-07	SJMW1SFP	793000	ug/mL	1
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	T/E	0.74767596			(T/E)/FC	1.87387E-05	SJMW1SFP	793000	ug/mL	15
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	T/X	0.13520653			(T/X)/FC	3.38863E-06	SJMW1SFP	793000	ug/mL	3
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	E/X	0.18083573			(E/X)/FC	4.53222E-06	SJMW1SFP	793000	ug/mL	4
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	(B+T)/(E+X)	0.13992272			((B+T)/(E+X))/FC	3.50684E-06	SJMW1SFP	793000	ug/mL	3
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	Fuel Carbon	39900	mg/kg		Fuel Carbon	1	SJMW1SFP	793000	ug/mL	793000
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	1,2,3-Trimethylbenzene	208	mg/kg		1,2,3 TMB/FC	0.005213033	SJMW1SFP	793000	ug/mL	4134
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	1,2,4-Trimethylbenzene	434	mg/kg		1,2,4 TMB/FC	0.010877193	SJMW1SFP	793000	ug/mL	8626
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	1,3,5-Trimethylbenzene	156	mg/kg		1,3,5 TMB/FC	0.003909774	SJMW1SFP	793000	ug/mL	3100
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	1-MethylNaphthalene	113	mg/kg		1-MN/FC	0.00283208	SJMW1SFP	793000	ug/mL	2246
NRMRL	JP-8	12/1/1995	5/15/1997	Bldg 4522, Seymour Johnson AFB, SC	Soil	SJSB2-5.5'	2-MethylNaphthalene	172	mg/kg		2-MN/FC	0.004310777	SJMW1SFP	793000	ug/mL	3418
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	Benzene	11.4	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	Toluene	32.5	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	Ethylbenzene	32.2	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	m-Xylene	68.9	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	o-Xylene	43.1	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	p-Xylene	24.5	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	Total Xylenes (m,p, and o)	136.5	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	Total BTEX	212.6	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	B+T	43.9	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	E+X	168.7	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	B/T	0.35076923								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	B/E	0.35403727								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	B/X	0.08351648								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	T/E	1.00931677								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	T/X	0.23809524								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	E/X	0.23589744								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	(B+T)/(E+X)	0.26022525								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	1,2,3-Trimethylbenzene	56.4	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	1,2,4-Trimethylbenzene	129	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	1,3,5-Trimethylbenzene	48.2	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	1-MethylNaphthalene	26.4	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 1	2-MethylNaphthalene	42	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	Benzene	11.1	mg/kg							no FC data

Lab Code	Fuel Type	Spill Date	Date	Site Name	Matix	Locid	Analyte	Results	Units	Flag	FC Analyte	FC Ratio	FPLocid	FPdensity	FPunits	SoilFuel (ug/mL)
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	Toluene	78.6	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	Ethylbenzene	64.2	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	m-Xylene	115	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	o-Xylene	72.4	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	p-Xylene	45.7	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	Total Xylenes (m,p, and o)	233.1	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	Total BTEX	387	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	B+T	89.7	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	E+X	297.3	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	B/T	0.14122137								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	B/E	0.1728972								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	B/X	0.04761905								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	T/E	1.22429907								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	T/X	0.33719434								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	E/X	0.27541828								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	(B+T)/(E+X)	0.30171544								no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	1,2,3-Trimethylbenzene	57.2	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	1,2,4-Trimethylbenzene	141	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	1,3,5-Trimethylbenzene	50.6	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	1-MethylNaphthalene	33.4	mg/kg							no FC data
NRMRL	JP-8	12/1/1995	7/19/1996	Bldg 4522, Seymour Johnson AFB, SC	Soil	Soil Sample 2	2-MethylNaphthalene	48.3	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	Benzene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	Toluene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	Ethylbenzene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	m-Xylene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	o-Xylene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	p-Xylene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	Total Xylenes (m,p, and o)	0.018	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	Total BTEX	0.036	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	B+T	0.012	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	E+X	0.024	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	B/T	1								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	B/E	1								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	B/X	0.33333333								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	T/E	1								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	T/X	0.33333333								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	E/X	0.33333333								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	(B+T)/(E+X)	0.5								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	1,2,3-Trimethylbenzene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	1,2,4-Trimethylbenzene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	1,3,5-Trimethylbenzene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	1-MethylNaphthalene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	7POP2	2-MethylNaphthalene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	Benzene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	Toluene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	Ethylbenzene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	m-Xylene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	o-Xylene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	p-Xylene	0.006	mg/kg	**						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	Total Xylenes (m,p, and o)	0.018	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	Total BTEX	0.036	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	B+T	0.012	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	E+X	0.024	mg/kg							no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	B/T	1								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	B/E	1								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	B/X	0.33333333								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	T/E	1								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	T/X	0.33333333								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	E/X	0.33333333								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	(B+T)/(E+X)	0.5								no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	1,2,3-Trimethylbenzene	0.147	mg/kg	@						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	1,2,4-Trimethylbenzene	0.219	mg/kg	@						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	1,3,5-Trimethylbenzene	0.0911	mg/kg	@						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	1-MethylNaphthalene	0.239	mg/kg	@						no FC data
NRMRL	JP-8	4/1/1996	7/19/1996	JP-8 Release Site, Pope AFB, NC	Soil	9POP2	2-MethylNaphthalene	0.323	mg/kg	@						no FC data

APPENDIX D

RESPONSE TO COMMENTS

Item	Page	Para/Line	Comment	Response
1	1-1	Para 2, Line 7	Change “is” to “was”.	Text has been revised as requested.
2	3-3	Para 4, Last Sentence	This statement is incorrect. Military facilities are not exempt from responding to catastrophic releases. In the case of DFSP Charleston, the response in 1974 used the best available technology for the 1970’s. Luckily, things have improved and we can truly clean the stuff up.	The sentence was changed to read: “However, site selection criterion #4 is typically not fulfilled on industrial sites, because catastrophic releases at these sites trigger legally required emergency response cleanup actions”.
3	4-2	DFSP Charleston, Line 2	Change “UGSG” to “USGS”.	Text has been revised as requested.
4	4-5	Para 2, Line 4	Change “resamped” to “resampled”.	Text has been revised as requested.
5	5-22	Section 5.2.3.4, Para 2, Line 5	Delete “may be related to a continued release of fuel compounds or” and replace with “are most likely due to”. There are no new sources of product. The free product appears to be trapped under the clay lenses and released when the water table drops.	Text has been revised as requested.